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Guiding You Through the Essentials

The Windows juggernaut notwithstanding, DOS remains essential to an estimated 75 million-plus PC users. Eleven years after its debut, first-timers still struggle alongside professional programmers to master the cryptic operating system's commands.

Likewise, the need for clear explanations of DOS fundamentals remains as strong as ever. How else to explain the continuing popularity of our *Essential Guide to DOS*? Now in its third revision, the *Essential Guide* reprises hands-on tutorial articles that have stood the test of time. This time around, we've had them updated by veteran computer writer Robert Hummel, who combed each reprinted article to ensure their continued technical relevance and accuracy.

Among the perennial favorites is Lewis Rosenfelder's expert overview of COPY, "New Tricks for an Old Command," which makes a nice companion to Hardin Brothers' "XCOPY Express." Each offers expert hints on streamlining one of DOS's more tedious chores. Also, the exhaustive "Master Guide to DOS Files" contains extensive new material covering files added and deleted in DOS 6.

The issue is chock-full of short program listings that will boost your DOS productivity in no time. You'll find more than 30 programs inside feature articles and in the Tip boxes scattered throughout the magazine.

Besides being updated for compatibility with all DOS versions from 3.3 through 6, this latest *Essential Guide* also contains an all-new feature section on the latest DOS upgrade, written by Dan Gookin, author of the million-copy best-selling book, *DOS for Dummies*. Dan set out to write the best, most comprehensive hands-on introduction to DOS 6 in the least amount of space. Also new for the 3rd edition is a pull-out reference card on DOS's file and directory commands. Like everything else in the magazine, it's annotated to show differences among DOS versions 3.3-6.

Finally, many of *DOS Resource Guide*'s regular readers will be pleased to know that all of the reprinted material comes from our sold-out issues #1 and #3. Dozens of people have asked us to reprint those issues, but publishing economics make it infeasible to print them in their original form. We're happy to present the best from those in-demand issues in this special edition, which offers useful guidance for every level of DOS user.

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DOS RESOURCE GUIDE

Special Issue: The Essential Guide to DOS

October 1993

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Pictured on the cover is Gateway 2000's 4SX-33V, a 33MHz 486SX local-bus machine with an upgrade socket that accepts Intel's Pentium chip.

The DOS 6 Crash Course

The author of DOS for Dummies helps you make the upgrade decision, then gets you started using DOS's newest commands and utilities.

by Dan Gookin

Welcome to *DOS Resource Guide's* crash course in DOS 6. Boom! Well, maybe *crash* isn't the operative word here. Since its release earlier this year, Microsoft Corp.'s latest version of its 12-year-old operating system has weathered the bumpy road of high expectations and low-down rumors.

Some complained that DOS 6 offers nothing for power users. Others (including some *DRG* reviewers) were underwhelmed by what they considered "tweaks" rather than major improvements to DOS 5. Still others hailed the new DOS as a modest step in the right direction.

However history judges DOS 6, it undoubtedly will come to be known as "the utility version." That's because Microsoft, for the first time, has bundled into DOS what many computer users consider must-have utilities: tools for quick backups and file transfers, antivirus protection, and disk compression and defragmentation—to name a few. Once available only through third-party manufacturers, these new programs finally place solutions to common computing problems within your machine's central operating system.

And DOS 6 is a bargain to boot. Its introductory price was \$49.95—about half the price of what *one* of its new utilities might have cost had you bought it separately from a third-party vendor. The regular upgrade price of \$129.95 still is so reasonable that even if you use only

two of its new programs, you'll get your money's worth.

But DOS's utilities are not DOS 6's only drawing card. Among the many improvements Microsoft has made, you'll find a more powerful CONFIG.SYS, a beefed-up UNDELETE, plus a handful of worthwhile, new commands. (For a quick summary of DOS 6's major additions, see the sidebar "DOS 6 Highlights"; the sidebar "Rest in Peace" lists the DOS files that Microsoft subtracted from its most recent upgrade.) Overall, it's a solid enhancement, although far from what I'd call a required upgrade.

Still, it might be just the DOS version you need. Stick around. Over the next few pages, I'll tell you all you need to know and bring you up to speed on everything that's new and fun in DOS 6. After this run around the fast track, you decide.

WHAT'S NEW?

Aside from the DOS 6 utilities, which I'll cover shortly, Microsoft added three new DOS commands—MOVE, CHOICE, and DELTREE—and updated some old favorites, including UNDELETE and UNFORMAT. SMARTDRV and CONFIG.SYS also underwent remodeling. For Windows users, the upgrade offers versions of UNDELETE, MSBACKUP, and an antivirus program, as well as Windows utilities for DBLSPACE (DoubleSpace) and SMARTDRV. Altogether the new DOS takes up a massive amount of space on your hard drive—almost 8MB on my system. That's quite a bit of real estate, but, overall, it's space well used.

A case in point: For over a decade, DOS users have

wanted a single command that could copy groups of files safely from one disk directory to another and delete automatically the original files. Microsoft finally granted that wish with an external command called MOVE.

For batch-file zanies, DOS 6's CHOICE command is the answer to the question all those ASK.COM programs have been posing for years. CHOICE permits user input in DOS batch files. It displays an optional message, then waits for you to type Y or N, or any other keys you specify. The key that you press returns a specific errorlevel value, which can be examined using the batch language's IF ERRORLEVEL command.

Another new external command, DELTREE, has powerful but potentially deadly consequences. DELTREE removes a directory—lock, stock, barrel, and every single file—and all of its subdirectories and their files. It prompts you (yes/no) before zapping the directory. But be forewarned: Short of digging out a recent backup, DOS provides no way to recover a deleted subdirectory.

Among the commands that received major rehabilitation in DOS 6 is UNDELETE, which now offers three levels of file protection (for more on this, see the section "A Powerful New UNDELETE").

Microsoft cleaned up the UNFORMAT command by removing its useless options and switches and replacing them with only those you need. Also, the FORMAT command was improved so that it now saves "unformat" information on any disk it reformats.

To make DOS's disk-caching program, SMARTDRV, more compatible with compressed drives (such as DBLSPACE's), the program now recognizes those drive types and doesn't cache them. This is only a minor up-

date, but one that saves a lot of time and mental work.

Finally, DOS 6's enhanced CONFIG.SYS lets users define multiple start-up configurations on a single PC, select initial foreground and background colors, and de-

DOS 6 HIGHLIGHTS

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New Utilities:

DBLSPACE—a disk compressor that frees up (in some cases nearly doubles) hard disk space.

MSBACKUP—a newer, faster DOS backup utility that lets you customize operations while using fewer floppy disks.

DEFRAG—pieces together fragmented files and places them in contiguous locations on a disk, which permits faster file access.

INTERLNK—a PC-to-PC file-transfer program that also lets you run programs and use the printer from a second laptop or other PC.

POWER—monitors power consumption on a laptop and shuts down parts of the system to help extend battery life.

MSAV AND VSAFE—two programs for virus detection and protection. MSAV offers virus scanning, detection, and cleaning; VSAFE safeguards programs and your hard drive from corruption or infection. (Windows versions of these programs are included.)

MEMMAKER—perhaps DOS 6's best utility, this program solves the DOS 5 dilemma of upper-memory management auto-magically.

MSD—a diagnostic program that reports on your hardware and software configuration.

MSDEX—a CD-ROM manager.

New Commands:

CHOICE—permits interactive batch files.

DELTREE—deletes directories and subdirectories along with their associated files.

MOVE—moves files or renames directories.

Improved Commands and Utilities:

CONFIG.SYS—now supports multiple setup configurations on a PC, among other things.

UNDELETE—now offers three levels of protection to restore files and track information about them.

REST IN PEACE

For the first time in recent memory, Microsoft actually killed off some DOS commands, removing them from DOS 6's repertoire. Some are dead and gone, but most have replacements. This "lightening of the load" doesn't make DOS 6 any smaller. Microsoft merely has freed us from commands that few used or that otherwise confused us and our software.

The most prominent entry in this mercy-killing category is EDLIN, a much-maligned (deservedly so) and primitive line editor, which had been included in every DOS edition since 1.0.

RECOVER, a command Microsoft also deep-sixed in version 6, had the best possible name and the worst possible effect.

Although the manual describes RECOVER as a tool for bringing fouled-up files back to life, its real effect was to utterly lay waste to every file—and all subdirectories—on any disk on which you attempted to use it. A bad command, in need of termination.

The table includes these and other notably notorious commands missing from DOS 6. (By the way, if you're installing the upgrade kit, the old commands are retained on your hard drive. If you're new to DOS 6, you'll never see them.)

—D.G.

Command	Replacement	Epitaph
ASSIGN	SUBST	A weary soldier from floppy disk days. No longer needed in the hard drive era.
BACKUP	MSBACKUP	Oft maligned, unfailingly avoided, and finally terminated.
COMP	FC	Better file-comparison utilities exist in third-party land—among them Michael Mefford's COMP.COM.
CV.COM	None	A debugging tool best left to those with an interest in such matters.
EDLIN	EDIT	Ding dong, EDLIN's gone!
EXE2BIN	None	A programmer's utility cancelled due to lack of interest.
GORILLA.BAS, et al	None	Demonstration QBasic programs in search of an audience.
GRAPHBL	None	What is it? Who needs it?
JOIN	None	Confounded, confused, and crashed disk utilities everywhere.
MIRROR	None	The kindest DOS 5 utility of them all, but made superfluous by improvements in UNFORMAT and UNDELETE.
MSHERC.COM	None	The Hercules monochrome graphics standard is a dying breed.
PRINTER.SYS	None	For users of IBM-brand printers only.
PRINTFIX	None	Good-bye problem; good-bye solution to the problem.
RECOVER	None	A killer of a utility that finally got the hatchet.
*.CPI	None	Who ever used the Code Page Information files anyway?

terminate the status of the Num Lock key, among other things. (See the section "CONFIG.SYS Reconfigured" for complete details.) All in all, these changes won't shake the earth. But they do address some shortcomings in previous versions, and they'll make computing life easier for most users.

DOS UTILITIES YOU NEVER EXPECTED

The DOS 6 utilities, on the other hand, are an important development, because they expand DOS's horizon far beyond simple file loading. COPY, DELETE, and RENAMES were important DOS achievements in another era, but today's bulging software and complicated sys-

tem setups require DOS to deal with more thorny issues, such as memory management, disk compression, and virus detection.

And DOS 6 is loaded with utility programs. They could number a dozen if you counted MSD (Microsoft Diagnostics); MSDEX, with its CD-ROM extensions; POWER, a program for conserving a laptop's battery power; UNDELETE and UNFORMAT; DOSHELP; QBasic, and on and on. Of these, six rank as *big deals*. They are DBLSPACE, MSBACKUP, DEFRAG, INTERLNK, antivirus programs MSAV and MWAV, and MEMMAKER.

DBLSPACE

Like Stac Electronics' popular program, Stacker, DBL-

File Edit View Layout Tools Font Graphics Window Help

File Mgr Save As Print PrPrvew Font Envelope GrpMode TextMode Speller Grammatik QuickFndr Tbl Edit

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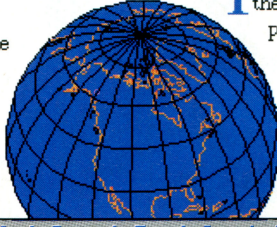
Go ahead and work with the numbers in the table. When you do, the budget figure on page one will automatically be updated.

Avean International
Departmental Budgets

As for expenditures, I feel that we can stay within the allotted boundaries. Therefore, our proposed departmental budgets for the first fiscal year of operation are based upon the information on page two. It's a tight bottom line, but I feel confident that we can follow the parameters.

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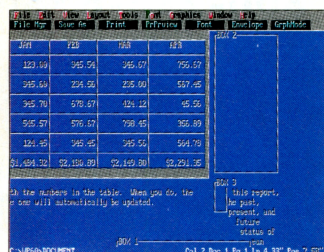


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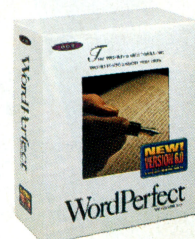
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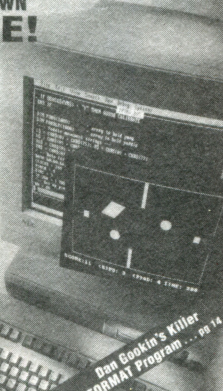
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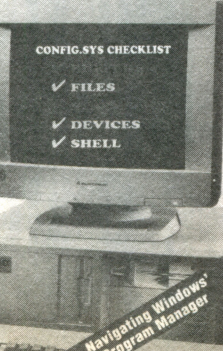
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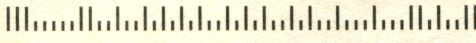
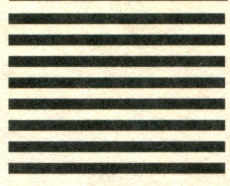
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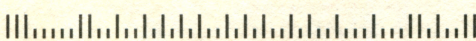
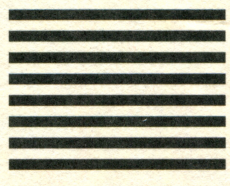
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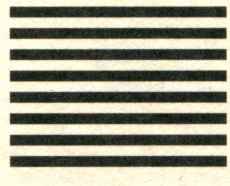
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DOS 6 TIP OUT WITH THE OLD

To free up some space on your hard drive after installing DOS 6, execute the DELODOS command to remove the old version of DOS from your system. (This means you can't uninstall it, so make sure DOS 6 is a "keeper" before typing the command.)

Also, chapter 5 in the *Microsoft MS-DOS User's Guide* lists files you can delete to give you more disk space. And you always can run DBLSPACE if you need extra room.

SPACE compresses all the files on your hard disk. A compressed file typically takes up half the disk space of a standard file, so you end up with about twice as much disk space.

Also like Stacker, DBLSPACE works as you use your hard disk. As files are copied to the drive, they're shrunk down—packed tight by mathematical algorithms that store binary information in a compressed format. When you read files from the disk, the same algorithms decompress the files, expanding them to their normal size. No information is lost in the process.

DBLSPACE is a DOS 6 elective. Obviously, if you're swimming in disk space, you won't need to install it. But when space is tight, just type DBLSPACE at the DOS prompt and the program sets itself up (but do read the tip box on DBLSPACE before you begin).

The quickest way to configure the program is to select the Express option from the main setup menu. If you know a bit about compression, or you are compressing additional drives on your system, select the Custom option. But be sure to read all the screens carefully. Don't just press Enter thinking "Yeah, yeah . . . get to the good stuff." Fig. 1 shows the screen in which DBLSPACE lets you select the drive to be compressed and estimates each disk's size after compression.

The compression takes a while, so this is a good command to type before you leave work for the day or just before retiring at home. Of course, the larger your hard drive and the more data that's on it, the longer DBLSPACE takes.

When the operation is complete, you'll find your hard drive has more disk space. Performance may suffer a

bit, but that's an acceptable trade-off for the megabytes of free hard disk space you'll gain. Other than that, your system will run the same as it did before.

After installing DBLSPACE, you may invoke this full-screen utility whenever you want to do maintenance work on your compressed drives. The program also is capable of compressing data on floppy disks, although this works a bit awkwardly and you can share the compressed floppy

disks only with PCs on which DBLSPACE is installed. You can't use the floppy disks as backup disks, either.

A final warning: DBLSPACE stuffs more files on your hard disk than would otherwise fit. You can back up and restore those files, but you cannot "uninstall" DBLSPACE and expect the extra files to fit. This makes disk compression a one-way street. Most users, however, view the extra disk space as a good trade-off.

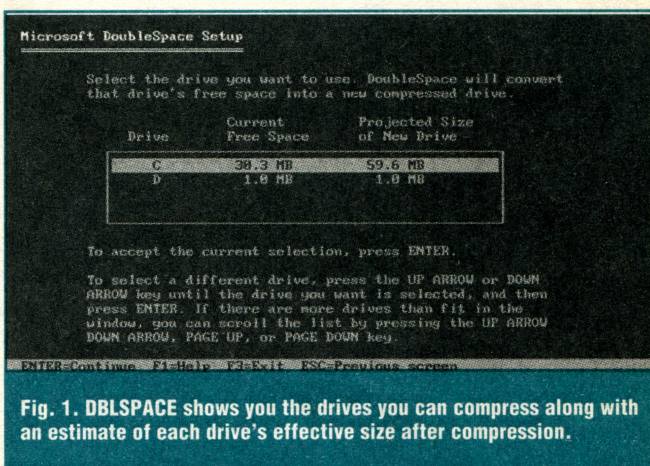


Fig. 1. DBLSPACE shows you the drives you can compress along with an estimate of each drive's effective size after compression.

Microsoft Backup

If you don't back up your data as often as you should, you now have one fewer excuse to put off the process. DOS 6 includes Microsoft Backup (MSBACKUP, for short), a boon for those who back up files to floppy disks or a network server. It features improved speed, file compression capability (meaning you use fewer disks), and flexibility in selecting files to back up or restore. (MSBACKUP both backs up and restores files.)

When you first run MSBACKUP, it will want to calibrate your system. It does this by performing a "mini-backup" of the MSBACKUP files. This takes about five minutes and two floppy disks to complete. I recommend going through the procedure. Afterward, MSBACKUP will be configured properly for your PC. (And you

DOS 6 TIP A FILE FINDER FOUND

The Microsoft Diagnostics program, MSD, has a wonderful file-finding tool hidden among its features—something nearly everyone overlooks.

After MSD analyzes your system, it presents a summary display. The File Find option is the first menu item in the File menu. Type the name of the file you want to find in the option's dialog box and list the hard drives or subdirectories you want to search. This is the easiest and quickest way to locate long-lost files in DOS.

can reuse the backup disks it makes for the test.)

In the backup utility's opening screen, you can use the mouse or the keyboard to select the Backup option when you're ready to start. With the help of the next screen (shown in Fig. 2), you tell the program how and what you want to back up.

MSBACKUP definitely is more daunting than the old BACKUP command, but you'll grow to appreciate its flexibility. The utility excels in file selection. You can choose files by location, name, or type, or direct the program to include or exclude all files matching a certain description.

To begin, you click on the Start Backup button with the mouse, or press Alt-S. MSBACKUP displays another busy screen and the backup starts. As it progresses, you'll notice that more files fit on each disk, thanks to MSBACKUP's file compression. Also, the program doesn't wait for you to press Enter after each disk; it proceeds automatically with the backup as quickly as possible.

In addition, you can save all of your selected options as an MSBACKUP setup file, and they can be recorded for playback—almost like a macro. For example, you can create a setup file for a full hard disk backup, today's work, or special projects. Although these setup files don't automate the process fully, they do reduce it to about four or five key presses after you start MSBACKUP.

Incidentally, MSBACKUP is a distant cousin to Symantec's The Norton Backup, and both programs look surprisingly similar. The Norton version includes more automation and runs a bit faster, however.

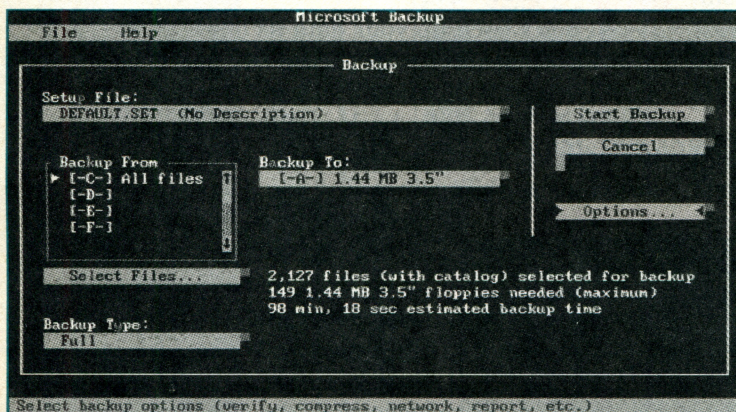


Fig. 2. The main screen in DOS 6's MSBACKUP utility lets you choose the source and destination drives and the files to be backed up. It then displays the total number of files you selected as well as the estimated processing time, and lets you start the backup process.

DOS 6 TIP DBLSPACE DOUBLE CHECK

Before installing DBLSPACE, I recommend that you take the following steps:

1. Back up your entire hard drive.
2. Run the CHKDSK command with its /F switch. Delete any stray clusters CHKDSK may find.
3. Optimize your hard disk with the DEFRAG command.
4. Restart your computer, pressing the F8 key after you see the "Starting MS-DOS..." message. Disable any disk caches, such as SMARTDRV or the FASTOPEN command. Don't log onto your network.

Taking the above precautions should help you avoid any problems, especially the massive data losses and inaccessible disks reported in the computer press and on CompuServe and other on-line services. The most important step is to back up your data before running DBLSPACE.

DEFRAG

At long last, DOS offers help for disk fragmentation. The DEFRAG command can pick up the pieces of fragmented files on your hard drive and reassemble them, making everything contiguous. The process, known as optimizing your hard drive, greatly speeds the time it takes the drive's read/write heads to retrieve data. As a result, your hard drive seems much faster.

DEFRAG is a smart utility. When you start it at the DOS prompt, DEFRAG asks you for a hard drive to optimize and then analyzes that drive. The percentage of the drive not fragmented tells you whether or not you need to proceed with optimization (see Fig. 3). If less than 90 percent of the drive is not fragmented, then you probably should proceed; otherwise you don't need to defragment. (And I wish Microsoft had taken the more direct approach of listing the percentage of fragmented files.)

If you elect to optimize your drive, then DEFRAG takes just a few seconds to run. It locates all fragmented files and pieces them back together.

The DEFRAG program is a good disk defragmenter, but not the best. It's a pared-down version of The Norton Utilities' SpeedDisk, minus some of its fancier options. Other popular defragmenters that take more time and do a more thorough job include PC Tools' Compress, the fabulous Mace Utilities, and UnFrag from Fifth Generation Systems.

INTERLNK

It's easy to overlook INTERLNK, because it's tagged as a laptop-to-PC file-transfer program. Instead, I like to consider it a two-computer network, since it really lets one computer take over the hard drives and printers attached to a second computer—just as if everything were in the same box. And unlike other file-transfer

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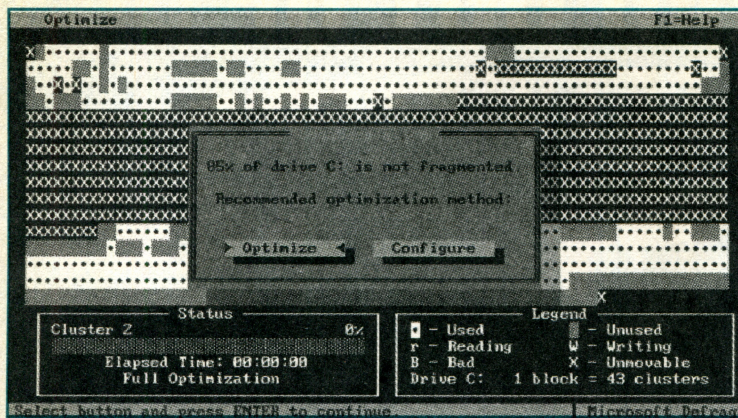


Fig. 3. The DEFRAG utility shows in graphics and in words how many of your files are fragmented. It then recommends an optimization procedure and lets you start the process, which can take several minutes. DEFRAG then tries to rejoin the separated files, speeding up hard disk performance.

programs, INTERLNK lets you access the extra disk drives and printers using standard DOS commands—instead of some wacky interface.

To run INTERLNK, you need two PCs (the transfer needn't involve a laptop computer), plus a special null-modem serial or parallel cable to connect them. One PC is designated as the server; the other as the client. INTERLNK consists of two programs to make this happen. The client must load the INTERLNK.EXE device driver when it starts; the server runs INTERSVR.EXE. You set up the server first, then reset the client to load INTERLNK.

When you run INTERLNK, the server's screen resembles that shown in Fig. 4. It lists which disk drives and printer connections it will share with the client. That's all that happens on the server; you can't use both PCs at once.

On the client, you have access to the server's disk drives and printers just as if they were part of your own PC. You can copy files to and from those drives, run any programs there (albeit slowly), and use the

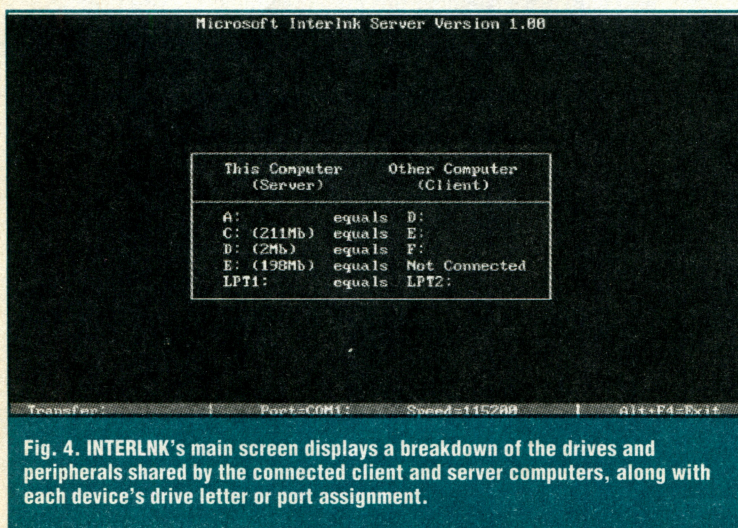


Fig. 4. INTERLNK's main screen displays a breakdown of the drives and peripherals shared by the connected client and server computers, along with each device's drive letter or port assignment.

server's printer. It's much easier to use than PC-sharing programs, such as Traveling Software's LapLink Pro and Fifth Generation Systems' The Brooklyn Bridge, which merely let you "tag and copy" files between two computers.

To quit INTERLNK, log back onto drive C on the client. Don't use any of the server's hard drives or printers when you disconnect. After you're logged onto drive C, press Alt-F4 on the server to stop INTERSVR. Then you may reset the client.

The Antivirus Tools

To help fight the viral plague, DOS 6 offers two handy virus utilities: MSAV.EXE, which is the cure, and VSAFE.COM, the protection. (The Windows versions of these are called MWAV.EXE and MWAVTSR.EXE, respectively.)

MSAV is similar to Central Point Software's Anti-Virus. It looks for signs of infection in memory, on your hard disk, and in all of your disk files. If it finds a virus, MSAV carefully removes it, or you may elect to delete the file from disk.

The second tool, VSAFE, is a memory-resident program that monitors sensitive areas of your disk and access to files. If a breach of security occurs, such as illegal file access or an attempt by a program to reformat your hard disk, a pop-up menu box informs you of the situation and gives you a chance to reset your PC.

To run MSAV, you type its name at the DOS prompt. From the main screen, press Alt-C to detect and clean any viruses found on drive C. The F2 key lets you check other drives. For example, you can press F2 and select a floppy disk if you want to scan a shareware disk that you picked up at a user's group meeting. I've never encountered any viruses on my PC (call me lucky), so I can't attest to the program's effectiveness.

VSAFE also runs when you type its name at the DOS prompt. It loads itself into memory and watches for an attempt to format the hard disk, to modify a COM or EXE file, or to modify the hard disk's boot sector.

I usually turn off the "modify a COM or EXE file" option; some of my programs do that in the course of operation, and it scares the hell out of me to see VSAFE's warning dialog box proclaim illegal access. To turn off this option, type Alt-V after VSAFE's control center starts to pop up. I press the 4 key to switch off monitoring of COM and EXE files. Other options are available. For example, selecting option 3 slaps an electronic "write protect" tab on the hard disk, preventing all disk access. This may sound like a bit much, but it's effective against all types of viruses—or users who simply are sloppy with the DEL command.

MemMaker

The last new DOS 6 utility on the list is perhaps the best and the easiest to use. DOS 5 joined in on the memory-management craze, but left us to figure out how to load as many programs as possible into upper memory and thus free as much conventional memory as possible. This drove people to Quarterdeck Office Systems' QEMM or Qualitas' 386MAX, where their special memory-optimization programs finished the job DOS 5 started.

DOS 6 offers MEMMAKER, its own memory-optimization program, which takes the hassle out of DOS memory management and leaves the user with access to much more conventional memory than otherwise would be possible.

Using this full-screen utility is simple: You type its name at the DOS prompt. MEMMAKER then presents you with a few options before it begins optimization. After performing several test runs, I can recommend the Express setup option. The Customize option asks you a few more questions, but nothing difficult.

MEMMAKER boots your computer two or maybe three times as it customizes your CONFIG.SYS and AUTOEXEC.BAT files. It definitely can load more device drivers and TSRs into upper memory than most users can do by simply tinkering with the DEVICEHIGH and LOADHIGH commands. And, if you don't have a CONFIG.SYS and AUTOEXEC.BAT file, MEMMAKER creates them for you, properly configured for your PC's microprocessor and memory setup.

A POWERFUL NEW UNDELETE

DOS 5 graced every DOS user with an UNDELETE command. All praise to Microsoft! I don't know how many times I've zapped a file to kingdom come only to have UNDELETE bring it back for me. Now DOS 6 has made the command even better. The new UNDELETE offers three levels of file protection: DOS protection, deletion-tracking, and a deletion sentry.

How Much Protection Do You Need?

The DOS protection level has the least overhead, requiring no memory or disk space to work—but your chances of recovery are slim. Deletion-tracking uses a smidgeon of memory and a wee bit of disk space to ensure recovery at times when DOS protection is at a loss. And the deletion sentry actually doesn't delete files at all! Instead, the files are copied to a special, hidden subdirectory and stored there. If you need a file, you can recover it fully every time. But the deletion sentry uses a great deal of disk space, because it moves files instead of deleting them.

To set up DOS protection with the UNDELETE command, you need to do...nothing! You receive DOS protection just by turning on your computer. You need to act quickly when you delete accidentally one or more files, however. If you use your disk or create new files or copy them, your chances of recovery lessen.

To activate deletion-tracking, you must load UNDELETE as a memory-resident program, preferably by invoking it at start-up in your AUTOEXEC.BAT. Adding the following command, for instance, tells DOS to monitor the files you delete from drives C and D:

```
UNDELETE /TC /TD
```

This provides you with better protection than what DOS offers, but the same warnings apply: Undelete your files quickly or the possibility of success grows dim.

For the highest level of protection, make sure you have enough disk space. The deletion sentry uses as much as 20 percent of your total disk space to save deleted files for later recovery. This may sound like overkill, but when you find yourself deleting files a lot—and not being able to recover them fully—you'll consider the option a blessing.

To activate the deletion sentry, add a command such as this to your AUTOEXEC.BAT:

```
UNDELETE /SC /SD
```

As with the previous command, this one protects the disks on drives C and D.

By the way, if you're curious as to which method of UNDELETE you're using, type UNDELETE /STATUS at the DOS prompt. If DOS displays an "Undelete not loaded" message, you have DOS protection. Otherwise, you'll see a message telling you that deletion-tracking or the deletion sentry is on duty.

Undoing the Damage

Recovering a file no matter which method you're using remains the same. Suppose you just zapped your current year's income tax records. They were contained in the spreadsheet file TAX94.WKS. You can undelete it easily with the following command:

```
UNDELETE TAX94.WKS
```

DOS 6

TIP

CHKDSK BEFORE YOU DEFRAG

Run the CHKDSK command before running DEFRAG. If CHKDSK finds any lost file fragments, clusters, or allocation units, run CHKDSK again with its /F option. (Delete the CHK files you don't need and find homes for the ones that belong to important files.) This keeps DEFRAG from wasting time on fragmented files that you don't want anyway.

Press Enter and UNDELETE tries its best to recover the file. Obviously, the higher the level of protection you have, the better your chances of recovery. DOS may ask a few questions about the file—its starting letter or other information. Use your best judgment.

Undoing mass destruction also is possible with UNDELETE. My rule is to use an UNDELETE command parallel to the one with which you deleted the files. For example, if you zap files with this command:

```
DEL *.DOC
```

you can undelete the whole bunch with:

```
UNDELETE *.DOC
```

One last word of advice: The UNDELETE and UNFORMAT commands are no excuse to be lazy. You should be careful when deleting files and subdirectories, and use the DEL, ERASE, and especially the DELTREE commands with care. If you're lucky, you may never need UNDELETE's three levels of protection. But when you do, they'll be a godsend.

CONFIG.SYS RECONFIGURED

Aside from its wealth of new utilities and beefed-up UNDELETE command, DOS 6 is a boon to anyone who has wrestled with two or more sets of CONFIG.SYS and AUTOEXEC.BAT files. Some users, for example, compose one set of start-up files for Windows, another for DOS, and still another for networking. Under Version 6, CONFIG.SYS received a major overhaul, which includes the addition of several new commands plus the ability to control multiple setup configurations on a PC.

As you probably know, a CONFIG.SYS file is a text file that resides in the root directory of your boot disk. Like AUTOEXEC.BAT, it provides setup information that DOS

uses each time you turn on your computer. Because it is a text file (as is AUTOEXEC.BAT), you can modify CONFIG.SYS to suit your needs.

Two new CONFIG.SYS commands—NUMLOCK and SET—provide good examples of how DOS 6 lets you modify your system's start-up. Suppose you want to turn off the Num Lock light and use only the cursor keys on the numeric keypad each time you power up. The NUMLOCK command, NUMLOCK=OFF, makes this possible. Its counterpart, NUMLOCK=ON, keeps the numeric keypad in operation.

Another new CONFIG.SYS command, SET, has the same effect in CONFIG.SYS as it does at the DOS prompt; you use it to create environment variables. Using a line such as the following, for example, lets you set up a search path in CONFIG.SYS:

```
SET PATH=C:\DOS;C:\WINDOWS;C:\UTIL
```

Also, you may now create environment variables in CONFIG.SYS—PROMPT, TEMP, and the like—something handled previously at the DOS prompt or in AUTOEXEC.BAT. DOS maestros can even build a CONFIG.SYS file that makes AUTOEXEC.BAT unnecessary.

Other CONFIG.SYS enhancements include two new options in the SWITCHES command, as described in the accompanying DOS 6 tip box and the sidebar "Making a Clean Start." But the big change in CONFIG.SYS, as I've mentioned, comes in the form of multiple start-up configurations.

Multiple CONFIG.SYS Mania

To set up a multiple configuration in CONFIG.SYS, you need to define various "configuration blocks," each of which contains its own instructions and commands for a particular setup. For example, the following configuration commands, which are designed for use with Windows, appear in a configuration block named *Windows*.

```
[Windows]
REM Windows SETUP
DEVICE=C:\WINDOWS\HIMEM.SYS
DEVICE=C:\WINDOWS\EMM386.EXE
NOEMS
DOS=HIGH
SWITCHES=/W
FILES=40
BUFFERS=15
```

The block title appears first and is enclosed in square brackets. All of the commands that follow it are part of that block, until the end of CONFIG.SYS or the beginning of the next block.

Here is a sample DOS configuration block:

DOS 6 TIP INTERRUPTING CONFIG.SYS

The INTERLNK.EXE device driver is a great candidate for the new query command in CONFIG.SYS. To take advantage of this option with INTERLNK, use the following line in your CONFIG.SYS file:

```
DEVICE?=C:\DOS\INTERLNK.EXE
```

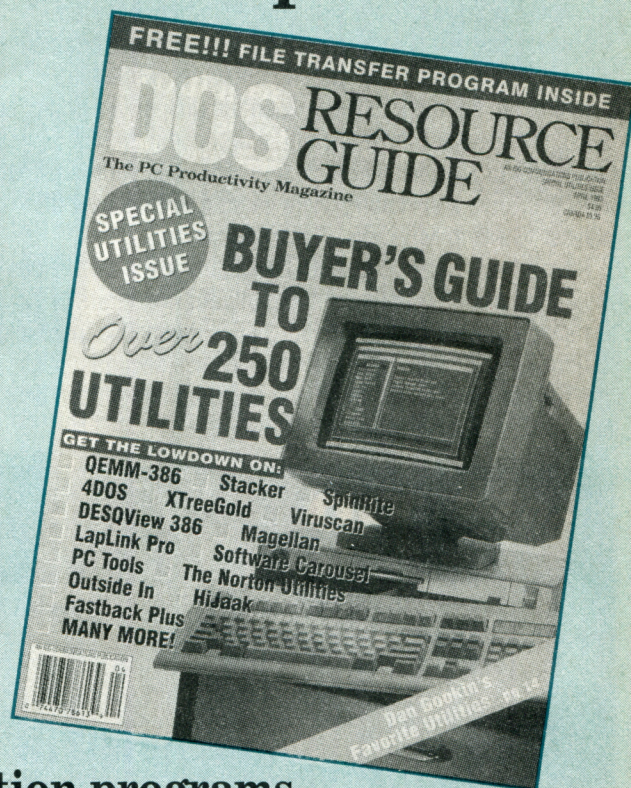
The question mark after the DEVICE command directs CONFIG.SYS to pause and display this prompt when your PC starts:

```
DEVICE=C:\DOS\INTERLNK.EXE[Y/N]?
```

Press the Y key if you want to use INTERLNK, press the N key to skip the command.

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MAKING A CLEAN START

For years, what went on inside your PC when it started seemed a mystery. The original IBM PC sat there for an eternity, with only the cursor flashing on screen while the machine ran its memory tests. Then the disk drives crunched twice, the speaker bleeped, and the first command in CONFIG.SYS or AUTOEXEC.BAT appeared. That was your clue that DOS was alive and kicking. With version 6, DOS now displays a "Starting MS-DOS..." message first.

After a two-second pause, DOS actually loads and issues the output from the first command in your CONFIG.SYS or AUTOEXEC.BAT files. Microsoft didn't stick this pause there just to annoy you or make DOS slower. The two seconds gives you time to take advantage of one of DOS's newest and best features: the interactive boot.

Microsoft's technical-support people for DOS begged the company's software engineers to add the interactive-boot feature. When you press F5 after DOS boots, your CONFIG.SYS and AUTOEXEC.BAT files are ignored. This lets you boot your system "clean," thus avoiding any problems with device drivers or TSRs, which makes it easier for a tech-support person to troubleshoot your system.

Pressing F8 is a little less drastic. It directs DOS to prompt you (yes/no) at each CONFIG.SYS command. If you type Y, DOS executes the command line; if you type N, it does not. And, if you're sick of typing Y or N at each command, press the Esc key and DOS continues its start-up chores uninterrupted.

After CONFIG.SYS runs its course, you are asked if you want to skip over all of AUTOEXEC.BAT as well. (The F8 key doesn't allow for interactive, yes/no approval of individual commands in AUTOEXEC.BAT.) Eventually, you're at the DOS prompt, which is as familiar as ever.

Other changes in CONFIG.SYS are discussed in the main text. But one other new item you may notice is a smaller quantity of text displayed as CONFIG.SYS runs. This is because the memory-management device drivers, HIMEM.SYS and EMM386.EXE, display start-up information only when directed. Otherwise, they run without making any "noise." So, if you are used to seeing the HIMEM.SYS banner when you first start DOS, don't be alarmed by its absence.

—D.G.

DOS 6 TIP TIME-SAVER

To avoid the two-second pause as DOS starts, insert the following command in your CONFIG.SYS file:

```
SWITCHES=/F
```

You still can take advantage of the F5 or F8 keys, but you must act quickly, because you won't have the extra two seconds to think about it. Or, if you don't want anyone messing with the F5 or F8 keys before DOS starts, insert the following command into your CONFIG.SYS file:

```
SWITCHES=/N
```

This directs DOS to ignore any F5 and F8 key presses it receives before it starts.

```
[DOS]
REM DOS SETUP
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE 1024 RAM
DOS=HIGH,UMB
DEVICEHIGH=C:\DOS\ANSI.SYS
FILES=40
BUFFERS=15
```

The commands in this configuration block may be the same as the ones shown in the Windows block, but they're separate. You build a configuration menu, such as this one, to provide a way for the user to select the appropriate setup block when the computer starts up:

```
[Menu]
MENUITEM=DOS
MENUITEM=WINDOWS
```

This main menu block is the first item that appears in CONFIG.SYS. The title, [Menu], tells CONFIG.SYS to look in this block for the special start-up menu commands.

As the name suggests, the MENUITEM commands listed here define two menu items for DOS's start-up menu.

After the initial "Starting MS-DOS..." message appears, DOS displays a menu listing your two configuration choices and asks whether you want to run the configuration commands for the DOS or the Windows configuration block.

DOS 6 includes four other configuration block commands to enhance the main menu:

- MENUDEFAULT selects one of the configuration blocks as a default after a period of time. The timeout value is optional.
- MENUCOLOR sets the start-up menu's foreground and background colors.
- SUBMENU identifies another CONFIG.SYS menu block, which be used as a submenu to display other options or choices. For example, you might have a networking submenu or one that lists various options for running Windows.
- INCLUDE "borrows" commands from another configu-

ration block. Suppose, for instance, that several of your configurations use the same set of commands. Instead of listing the set repeatedly, you may put them all in a [Shared] block, and then use the following command in each configuration block that requires the commands:

```
INCLUDE=SHARED
```

If all of your configurations share commands, you can toss the duplicate commands into a block named [Common], which indicates that all the commands are shared (or *included*) with all other configuration blocks.

Unfortunately, no multiple configuration commands exist for AUTOEXEC.BAT. Nevertheless, DOS saves any configuration block you select from the menu in the environment variable CONFIG. You can use that variable in your AUTOEXEC.BAT file to further customize your start-up procedures.

A Caveat or Two

You should use these new CONFIG.SYS enhancements with caution. A CONFIG.SYS file with multiple configurations can be long and complex. Installation or setup programs that modify CONFIG.SYS can make matters worse. Finally, memory managers that try to optimize CONFIG.SYS can't make heads or tails of configuration menus, and they can really foul up your system.

These problems shouldn't discourage you from taking advantage of DOS 6's new and improved CONFIG.SYS, however. If you routinely edit your CONFIG.SYS and AUTOEXEC.BAT files to build custom configurations, these new multiple setup capabilities may make life much easier right from the start.

DEBUNKING DOS 6 RUMORS

Nothing induces as much fear and loathing into the DOS faithful as an upgrade. Actually, any software upgrade can knot up your stomach; just getting everything to work together often is a struggle. The question is, why rock the boat when it all works right now?

Or, perhaps you've been rocked by some rumors you've heard about DOS 6. Here are the most common ones making the rounds:

- Upgrading will erase all the files on my hard drive. The "you might lose all your data" rumor also circled around DOS 5. It didn't happen then, and it won't happen now. In reality, DOS 5 was more of a radical upgrade than DOS 6. With version 5, the core operating system changed. But DOS 6 is similar to DOS 5 at its core, and the upgrade process merely copies the new DOS files to your hard drive, replacing the older versions you may already have. After the upgrade, your system will run exactly as it did before—but with a new DOS version.
- DBLSPACE will destroy my data. The DBLSPACE disk compression program takes a full hard disk and ekes a few more megabytes of space from it. This is a great solution to the bulging-disk problem everyone faces sooner or later. Upgrading to DOS 6 means that you have the DBLSPACE program available when you need it. If you don't want to use DBLSPACE, then

THE LEGACY OF DOS

Historians and personal computing's old-timers know that DOS was born in 1981 with the introduction of the IBM PC. DOS 2.0 came along two years later with IBM's PC/XT, the first PC to offer hard drives as standard equipment. Version 2.0 supported hard drives and added the bulk of what we today consider DOS's core commands, including CD, MD, RD, and CONFIG.SYS. The IBM PCjr brought with it DOS 2.1, which could support the computer's half-height disk drive.

IBM's PC/AT, the first 80286, was given DOS 3.0 on its birthday in 1984. The introduction of network hardware and software, laptops, and different types of disk drives heralded the arrival of DOS 3.1, 3.2, and, eventually, version 3.3, which was released with OS/2 1.0 back in 1987, along with IBM's PS/2 line. Then DOS stood still.

Finally, late in 1988, version 4.0 came out. It was remarkable in that it served no special purpose—no specific PC model, no new disk drive format. Users were underwhelmed by its much-ballyhooed graphical shell and dismayed by its many bugs, and few bothered to upgrade from version 3.3.

In the years that followed, Microsoft concentrated on enhancing Windows and developing OS/2 with IBM. Eventually, the OS/2 deal fell apart, and soon Microsoft realized it would need a stronger DOS platform on which to run Windows. The growing popularity of 386 PCs meant DOS would have to address the massive amount of memory they could use.

The solution was DOS 5, introduced in 1991. It brought memory management to the forefront and, most importantly, got everyone all excited about DOS again. Version 5 sold well beyond Microsoft's expectations, becoming the best-selling single program for nearly two straight years.

Which brings us to DOS 6. No major hardware upgrade heralded its announcement earlier this year. In fact, both version 5 and 6 are very similar. What's new are the utilities Microsoft now bundles with DOS 6, its enhanced CONFIG.SYS, and the addition of a few handy new commands.

DOS 6 is an evolutionary, rather than a revolutionary, upgrade. Like most DOS editions, it addresses some shortcomings in previous versions and generally makes life a bit easier for computer users. It also marks another major milestone along the road for this amazingly successful operating system.

—D.G.

you don't have to. Your hard disk isn't compressed automatically when you install DOS. In fact, I've been using DOS 6 successfully on one of my computers for months, without DBLSPACE.

InfoWorld, a weekly newspaper covering the computer industry, ran a test in which the magazine's reviewers discovered a high error rate on hard disks with DBLSPACE installed. No one else managed to duplicate the problems, however. Microsoft's tech support people have reported very few problems with the program, and none of the magnitude suggested by the *InfoWorld* article.

So is DBLSPACE bad? Probably not. Hard disk compression is a solid technology. Problems may occur, but perhaps only as frequently as they do with The Norton Utilities, PC Tools, or other similar programs. And remember, you don't have to use DBLSPACE.

INSTALLATION HINTS

For those who fear the upgrade process—especially with a program as central as DOS—rest assured. Installing DOS 6 is safe and simple. And the more you know about DOS 6's installation program, *SETUP*, the tamer life will be. In fact, if you run *SETUP* as advertised, it makes a special "uninstall" disk that you can use to restore your PC to its pre-DOS 6 state. That way, you can test drive DOS 6 for a while, and if it's not for you, you can run the *UNINSTALL* program and get your old system back. But if you decide you like DOS 6, you're there! (You should, however, execute the *DELOLDOS* command, which removes the old version of DOS from your hard drive, thereby saving you some 5MB to 7MB of disk space.)

The Switch Is On

To install DOS 6 on your PC, place the first disk in your boot drive and run the *SETUP* program on that disk. *SETUP* includes a few options that permit customized installation, if that's your desire. Otherwise, the program first prompts you to insert one (or two) uninstall disks, which, as I've mentioned, lets you change your mind and return to your old DOS version. Second, it copies the new DOS 6 files from the distribution disks to your hard drive, replacing your old DOS version. The whole operation takes less than 15 minutes, after which your PC resets and you have DOS 6 installed.

To view *SETUP*'s dozen-or-so options before installing DOS 6, log onto the drive containing the DOS disk and type:

```
SETUP /?
```

Here are the best switches to use:

- */G* directs *SETUP* to install DOS 6 but not to create the uninstall disks. This improves installation time by several minutes, but it also leaves you with no option for uninstalling DOS 6.
- */F* directs *SETUP* to install a minimal DOS 6 system (minus the fancy utilities) on a floppy disk. You can use the DOS 6 boot disk that's created to start your system, which lets you test drive your software under DOS 6 to make sure everything works. If it does, you can run *SETUP* again and perform a full hard-disk installation.
- */E* directs *SETUP* to install DOS's new utilities in both Windows and DOS versions. If you don't specify this switch, you're asked which utilities you want when *SETUP* runs; you can pick DOS utilities, Windows utilities, or both. The */E* switch picks both automatically.

A Bit of Advice

I used the */G* switch only, because the machine on which I installed DOS 6 was my designated DOS 6 PC. If you opt for one of *SETUP*'s "minimal" installations, you won't get all of the cool, new utilities DOS 6 offers. Also, those utilities are stored on the distribution disks in a compressed format. Although you can use DOS's *expand* utility to copy and decompress the files one at a time from the distribution disks, I recommend running *setup* again and letting it do all the expanding for you.

—D.G.

- DOS 6 isn't necessary. It isn't! No upgrade is. Many will continue to use DOS 5 and get the most from it. Technologically speaking, the heart of DOS 6—the programs that really comprise DOS—hasn't changed much from version 5. This means no new software will be "DOS 6 only." Indeed, few packages today are "DOS 5 only."

If you already have a decent backup program (other than DOS's old *BACKUP* command), a file-transfer program, a disk defragmenter, anti-virus tools, a memory manager, and undeletion and unformatting tools, then you may not need DOS 6. If you're missing any of those tools, however, Microsoft's \$129.95 upgrade price makes these utilities a bargain.

Overall, DOS 6 is a reliable product. I've installed it on three of my office computers with no problems. I use DBLSPACE only on a laptop, and it's been working fine for months now. But my main system stays with DOS 5 and *Stacker*. The reason? I already have purchased all the utilities DOS 6 offers, and most of the packages I have are feature-laden products offering many more options than the utilities bundled with DOS. If you like the new commands and enhancements Microsoft has added to DOS 6 and you need the utilities, then upgrade. Otherwise, stick with DOS 5. ■

Master Guide To DOS Files

What's the difference between SELECT.COM and CHOICE.COM? Why keep QBASIC.EXE around if you're not a Basic programmer? Find out in an instant.

by Dave Rowell and John Wolfskill

Take a scroll through your DOS directory. That long, mostly alphabetical list of programs can inspire guilt or intimidate. Unless you've taken time to study the intricacies of the operating system, you probably don't know what many of the files do and which ones you really need on your hard disk or bootup floppy disk. The following quick reference guide to DOS programs provides short profiles to help you fill in the gaps in your knowledge or weed out unnecessary files.

Our master list covers the full complement of programs you'll find in a directory of MS-DOS 6. Also included are a handful of files specific to IBM's PC-DOS and the 20 or so files that Microsoft relegated to a supplemental disk in its most recent DOS upgrade (see the sidebar "MS-DOS 6's Supplemental Files"). The guide does not, however, discuss certain frequently used commands, such as COPY, DEL, or DIR, because they are "internal" commands and thus are part of DOS itself. Nor does it mention the many files on the DOS system disks whose only duties involve assisting with setup procedures—files with extensions such as VID and GRB, for instance—because they never make their way into your DOS directory.

Over time, MS-DOS has added new commands and new functions for existing commands. To make it clear which features your DOS version includes, the text

notes the version number with which a program or important feature was introduced. You should be aware, however, that manufacturers of IBM compatibles sometimes modify MS-DOS programs slightly; consequently, some files that come with your version of DOS may not be exactly the same as Microsoft's.

As you read through the descriptions that follow, pay special attention to the filenames highlighted in color. These are the programs that every MS-DOS 6 user should know and use.

4

4201.CPI (CPI stands for *code-page information*) and similar files, 4208.CPI and 5202.CPI, contain character-set information that provides national-language support on IBM Proprinter Models 4201, 4202, 4207, and 4208 and on the IBM Quietwriter III Model 5202. You must use the MODE command to load the desired character set into memory from these files. (4201.CPI is available in MS-DOS 3.3 through 5, 4208.CPI is available in MS-DOS 4.0 through 5, and 5202.CPI is available in MS-DOS 3.3 through 5. Under MS-DOS 6, all three are available on the Supplemental disk.)

A

ANSI.SYS gives you greater control of your screen display and keyboard by letting you do such things as add color to your DOS screens and create your own DOS keyboard macros. Because ANSI.SYS is a device driver, you

must add a **DEVICE** command to your **CONFIG.SYS** file before you can alter your display or key assignments.

Beginning with MS-DOS 5, you can store **ANSI.SYS** in upper memory. But in earlier versions, **ANSI.SYS** takes several thousand bytes of RAM (the amount varies according to the DOS version); the program also slows display times somewhat. (Available in MS-DOS 2.0 and later.)

APPEND.EXE provides a list of subdirectories for DOS to search if it can't find a data file in the current directory. Some older programs that don't support subdirectories (early versions of WordStar, for instance) depend on overlays and data files that the main program reads after it starts to run. If you want to use an early version of WordStar from another directory (one in which you keep your WordStar text files, for example), you can list the WordStar program directory in both the **PATH** and **APPEND** commands. **PATH** enables DOS to find the initial WordStar program file, and **APPEND** lets DOS find WordStar's data files. WordStar finds your text files because you're operating from that directory.

APPEND works only for file reading. If you attempt to write to a file that **APPEND** located in another directory, DOS writes the file to the current directory. If you use **APPEND** with **ASSIGN**, you must invoke **APPEND** first. Unlike **PATH**, which supplies an alternate search path for program files, **APPEND** is memory resident and thus consumes RAM. (Available in MS-DOS 3.2 and later.)

APPNOTES.TXT is a text file that tells you how to use MS-DOS 5 and later with certain programs. Lotus 1-2-3, WordPerfect, and Ventura Publisher are among the programs discussed in the version of **APPNOTES.TXT** that comes with MS-DOS 5 and later.

ASSIGN.EXE sends operation requests destined for one drive to another. If, for example, you have a program that insists on reading data from or writing it to floppy drive A, you can use **ASSIGN** to send the data to a faster hard drive or a RAM disk. Rerouting drive requests from one drive to another doesn't affect the use of the second drive, but you shouldn't use **ASSIGN** without reason. It is incompatible with several DOS commands and with any program that requires specific knowledge of a drive's size and format. (Available in MS-DOS 3.0 through 5 and on the MS-DOS 6 Supplemental disk.)

ATTRIB.EXE protects a file or files from accidental change or deletion by setting the read-only attribute in the file's directory entry. To unprotect a file, you use the **ATTRIB** command to reverse a file's read-only status. (Available in MS-DOS 3.0 and later. With versions 3.2 and later, you also can use **ATTRIB** to change a file's archive attribute, which can affect whether the **BACKUP** [or **MSBACKUP**], **XCOPY**, and **RESTORE** commands have an effect on the file. Version 5 and later give users access

to a file's hidden attribute bit, which makes it possible to hide and unhide files easily.)

AUTOEXEC.BAT gives you a way to issue a series of commands to DOS automatically whenever you start up your computer. You can use **AUTOEXEC.BAT** to do such things as set system variables (**PATH** and **PROMPT**, for example) and load memory-resident programs. Like other batch files, **AUTOEXEC.BAT** is a text file that you can create or modify within any word processor that saves text in ASCII format. In many cases, computer dealers set up an **AUTOEXEC.BAT** file during presale installation procedures. **MEMMAKER.EXE** (DOS 6) makes a backup copy of your **AUTOEXEC.BAT**, renaming it **AUTOEXEC.UMB** and storing it in your **/DOS** directory. (Available in MS-DOS 1.25 and later.)

B

BACKUP.COM, renamed **BACKUP.EXE** starting with version 5, backs up files (usually from a hard disk to a series of floppy disks) so that you can recover valuable data in the event of hard drive disaster. **BACKUP** can copy a file larger than a destination floppy by writing it to several disks. It also can back up all the files on your hard disk in a single operation, recording your subdirectory structure as it backs up. You must use the DOS **RESTORE** command to reverse the process. (Available in MS-DOS 2.0 and later, and on the version 6 Supplemental disk. In version 6, **MSBACKUP.EXE** replaces **BACKUP.EXE**.)

BASICA.COM is IBM's advanced version of the Microsoft Basic programming language. Improvements over **BASIC.COM** include functions for important capabilities, such as disk I/O and graphics. Like **BASIC.COM**, **BASICA.COM** depends on program routines found only in IBM ROM chips. To preserve IBM compatibility, some versions of MS-DOS come with a program called **BASICA.COM** that serves as a loader to **GW-Basic**. (Available in PC-DOS 1.0 through 4.x.)

BASIC.COM is a simple version of the Microsoft Basic programming language that, for most of its functions, relies on program routines built into the ROM of IBM computers. Therefore, **BASIC.COM** doesn't run on non-IBM computers. **BASIC.COM** doesn't let you use disk drives; for that, you must use **BASICA.COM** instead. To preserve IBM compatibility, some versions of MS-DOS come with a program named **BASIC.COM** that serves as a loader to **GW-Basic**, the Basic that comes with MS-DOS 1.0 through 4.x. (Available in PC-DOS 1.0 through 4.x.)

C

CHKDSK.COM, renamed **CHKDSK.EXE** starting with version 5, checks the integrity of a disk's directory structure and also tells you the amounts of free memory and disk

space that remain on your system. You should use CHKDSK regularly on your hard drive to look for disk problems and then follow up by using CHKDSK's /F option to fix any that you find. If you don't rectify problems quickly, your data losses will only compound. (Available in MS-DOS 1.25 and later.)

CHKSTATE.SYS is a program used by MEMMAKER.EXE to optimize high memory. During memory optimization MEMMAKER adds CHKSTATE.SYS to the beginning of the CONFIG.SYS file, removing it after optimization is complete. The program is used exclusively by MEMMAKER.EXE. (Available in MS-DOS 6.)

CHOICE.COM lets you write batch files that solicit and evaluate user input. With CHOICE, you can, for example,

ask the user to respond to a yes/no question by pressing the Y or N key. Because DOS returns the user's response as an errorlevel value, the calling batch file can analyze the response, taking one course of action if the Y key is pressed and another course of action if the N key is pressed. (Available in MS-DOS 6.)

COMMAND.COM is DOS's command processor, which acts as an intermediary between you and DOS, presenting the DOS prompt, processing your commands, and running the programs that you request. If it isn't in the root directory of your boot drive, DOS doesn't run. (Available in MS-DOS 1.25 and later.)

COMP.COM, renamed COMP.EXE starting with version 5, compares two files to determine if they're different.

Current Directory (.)
Whenever you take a directory of a subdirectory, a single period is the first entry. The entry functions as a placeholder in the directory structure and represents the current directory. You can use the period in DOS commands, just as you would the directory name.

Volume Label
If you named your disk, that name shows up here. Otherwise, DOS tells you that the disk has no label.

Parent Directory (..)
The second entry in any subdirectory listing is the double period, which stands for the parent directory of that subdirectory. Like the single period, the double period may appear in DOS commands.

File Extension
A file's extension should tell you what kind of file it is. A program you can load and run from the DOS prompt must have a COM, EXE, or BAT extension. The first two types of files are executable machine language programs. A COM file, DOS's older type of machine language program, is smaller than 64K. A BAT file contains a list of DOS commands that COMMAND.COM interprets line by line. Most SYS files are device drivers that you can load into memory from your CONFIG.SYS file. Most device drivers let DOS interact with devices, such as tape drives and RAM disks, with which it wasn't designed to deal. Others, such as ANSI.SYS, expand the power of devices DOS already supports. Files with a BAS extension are Basic programs.

Volume Serial Number
DOS 4.0 and later assign a volume serial number during formatting. DOS uses the assigned number to keep track of which disk is in a drive; it changes a disk's serial number only when it reformats the disk.

Pathname
The DIR command tells you where you are by providing the full pathname of the directory you're listing.

Creation Time
Like a file's creation date, creation time can be important. An a stands for A.M.; a p stands for P.M.

Bytes Free
This figure tells you how much unused space remains on a disk. The bigger this number, the better you'll feel.

File Size
Each directory entry tells the size of its file in bytes. Because DOS allocates disk space in clusters of a fixed length, a file probably takes more space than its byte count indicates.

Creation Date
When you create or modify a file, DOS marks the file with the current system time and date. The date on which a file was created or last modified can be critical information when you have several versions lying around.

```

Volume in drive A has no label
Volume Serial Number is 0E38-10EB
Directory of A:\TEST

.                <DIR>          05-23-93   6:05p
..               <DIR>          05-23-93   6:05p
COMMAND.COM      47845          04-09-91   5:00a
ANSI.SYS         9029          04-09-91   5:00a
DISKCOPY.COM     11793         04-09-91   5:00a
DRIVER.SYS       5409          04-09-91   5:00a
FORMAT.COM       32911         04-09-91   5:00a
XCOPY.EXE        15804         04-09-91   5:00a
AUTOEXEC.BAT      86          05-23-93   6:33p
EDIT.COM         413          04-09-91   5:00a
EDIT.HLP        17898         04-09-91   5:00a
SETKEYS.BAS       219         05-27-93  10:34p
               10 file(s)      141407 bytes
                               215040 bytes free
  
```


Unfortunately, however, the **COMP** command has limited usefulness: If the two files have different lengths, comparison ends immediately; if the files are the same length, the program displays in hexadecimal notation the first 10 of any bytes that differ. See **FC.EXE** for the more useful MS-DOS equivalent. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk [as

well as in some earlier OEM versions].)

CONFIG.SYS is a text file that contains system setup information that DOS uses each time you boot up your computer. When you add expansion hardware, such as a tape drive, you add a **DEVICE** command to **CONFIG.SYS** to tell DOS how to work with the new hardware. You

also can improve drive performance by setting certain parameters from within **CONFIG.SYS**. As with **AUTOEXEC.BAT**, many new computers come supplied with a **CONFIG.SYS** file. **MEMMAKER.EXE** (DOS 6) makes a backup copy of your **CONFIG.SYS** file, renaming it **CONFIG.UMB** and storing it in your **/DOS** directory. (Available in MS-DOS 2.0 and later. MS-DOS 6 includes a number of new key words, which let you create a **CONFIG.SYS** that offers several different setup options.)

COUNTRY.SYS is a data file containing information that DOS uses when setting up your computer to display dates, times, and currencies in the format used in a particular country. **COUNTRY.SYS**, which isn't a device driver, is one of a growing number of DOS files that provide support for foreign languages. If you don't have international dealings, you can delete these files safely from the DOS directory on your hard disk. (Available in MS-DOS 3.3 and later. With versions of DOS earlier than 3.0, the formats for dates, times, currencies, and character sets are contained in DOS.)

CV.COM, also known as CodeView, is a programmer's debugging tool that is useful for those who have dealings with Microsoft's QuickBasic or MASM, the company's macro assembler. (Available in MS-DOS 4.0 through 5 and on the MS-DOS 6 Supplemental disk.)

DBLSPACE.EXE increases available disk space by compressing the programs and data files stored on hard disks or floppy disks. **DBLSPACE** is a real-time data compactor, which means it rapidly compresses a file

MS-DOS 6'S SUPPLEMENTAL FILES

A number of DOS files and utilities available in previous DOS versions were omitted from the DOS 6 upgrade package. The files are available on Microsoft's MS-DOS 6 Supplemental disk, which you may order by filling in the coupon on the next-to-last page of your DOS 6 manual and including \$5 (plus shipping and tax, where applicable).

If these files already exist on your system, Setup doesn't remove them from your DOS directory during installation. It does, however, update your system's **SETVER** table to make existing files compatible with MS-DOS 6.

FILENAME(S)	PURPOSE
4201.CPI , 4208.CPI , and 5202.CPI	Provide code-page information for certain IBM printers.
ASSIGN.COM	Redirects to another drive requests involving disk operations.
BACKUP.EXE	A backup program replaced by MSBACKUP.EXE .
COMP.EXE	Compares two files byte for byte.
CV.COM	An updated version of CodeView, a programming tool used to debug code written in such languages as QuickBasic and assembly language.
EDLIN.EXE	DOS's old line-oriented editor.
EXE2BIN.EXE	Lets you convert to COM format a file written in EXE format.
GORILLA.BAS	A demonstration QBasic program.
GRAFTABL.COM	Loads the extended character set into memory so that you can use it in CGA graphics modes.
JOIN.EXE	Lets one disk masquerade as a subdirectory of another disk.
LCD.CPI	Provides code-page information for the LCD screens used in certain portable computers.
MIRROR.EXE	Creates a deletion-tracking file that DOS 5's UNDELETE and UNFORMAT use to recover files.
MONEY.BAS	A demonstration QBasic program.
MSHERC.COM	Lets DOS programs operate with a Hercules graphics adapter.
NIBBLES.BAS	A demonstration QBasic program.
PRINTER.SYS	Lets certain IBM printers switch among code pages.
PRINTFIX.COM	Disables the verification of a printer's status line.
RECOVER.EXE	A last-ditch recovery program that can save readable portions of damaged disks.
REMLINE.BAS	A demonstration QBasic program.

each time you alter it, then decompresses the file when you need it. DBLSPACE.EXE has several companion files. The DOS system file, DBLSPACE.BIN, provides access to disks that were compressed using DBLSPACE, DBLSPACE.SYS moves DBLSPACE.BIN to its final location in memory, and DBLSPACE.HLP is the disk compressor's on-line help file (DBLWIN.HLP is the Windows version of this file). DBLSPACE.INF is a data file used by DBLSPACE.EXE. (Available in MS-DOS 6.)

DEBUG.COM, renamed DEBUG.EXE starting with version 5, provides you with powerful debugging capabilities, including the ability to trace through machine language programs and to read and modify memory, files, and disk sectors. Because DEBUG is hard to use and potentially dangerous, under most circumstances it is a tool best left to programmers. However, computing novices can learn to use it to create small and powerful assembly language programs. (Available in MS-DOS 1.25 and later.)

DEFRAG.EXE defragments the files on a hard or floppy disk, reorganizing them so that the information in each file is stored in consecutive sectors. Because a drive can read defragmented files without jumping among different sectors, using DEFRAG.EXE regularly provides a way to reduce the time it takes to access a disk. A companion file, DEFRAG.HLP, provides on-line help for DEFRAG.EXE. (Available in MS-DOS 6.)

DELOLDOS.EXE is a DOS 6 program that deletes files associated with your previous DOS version. You may invoke this command after you're sure you don't want to uninstall DOS 6 or if you decide to use DBLSPACE.EXE. You can't uninstall DOS 6 if you compress your hard disk using DBLSPACE. (Available in MS-DOS 6.)

DELTREE.EXE lets you delete (prune) an entire branch of your directory tree with a single command. When you invoke it by specifying the name of a directory to delete, it removes the files in the specified directory, all subdirectories and files below the specified directory, and the directory itself. (Available in MS-DOS 6.)

DISKCOMP.COM compares two floppy disks byte for byte to ensure that they have identical contents, which makes this utility valuable for verifying that DISKCOPY has done its job. In other circumstances, the program might not prove as useful. If two disks contain the same files, but the files aren't distributed identically on the disks, DISKCOMP doesn't consider the disks identical. (Available in MS-DOS 3.2 and later.)

DISKCOPY.COM makes an exact copy of any floppy disk, duplicating track for track both format and file placement. DISKCOPY formats the destination disk if necessary, but you should use the FORMAT command instead,

because it checks for bad clusters. If FORMAT reveals that a floppy disk has bad clusters, don't use DISKCOPY to copy files to the disk, because you'll get a bad copy. (The disk is fine for other purposes, however, because FORMAT closes out bad clusters.) If the source disk contains fragmented files, use COPY instead, because it copies by file instead of by track, storing files in consecutive sectors on the destination disk. This ensures that your files load faster. (Available in MS-DOS 2.0 and later.)

DISPLAY.SYS lets you switch among foreign-language character sets (code pages) on your display. This device driver works only with EGA, VGA, and PC Convertible LCD displays. (Available in MS-DOS 3.3 and later.)

DOSHHELP.EXE is a data file containing help information. Under DOS 5, the file holds information displayed by the HELP command. Under DOS 6, it holds data displayed by the FASTHELP command. (Available in MS-DOS 5 and 6.)

DOSKEY.COM is a utility that lets you recall commands you've typed at the DOS prompt. The old trick of pressing F3 provides a way to repeat the previous command, but invoking DOSKEY gives you access to virtually every command you've used during your present computing session, because the program maintains a stack of commands in memory. DOSKEY also contains provisions for editing the command line and permits you to create keyboard macros. A memory-resident program, DOSKEY occupies about 3K of memory. (Available in MS-DOS 5 and later.)

DOSSHELL.BAT is a batch file that starts PC-DOS 4.x's shell program. (Available on MS- and PC-DOS 4.x.)

DOSSHELL.EXE starts the MS-DOS 5 and later shell program, a menuing system that provides a visual way of dealing with DOS. An improvement over the interface in version 4.x, the shell that comes in version 5 and later provides a point-and-click file manager, a file viewer, and a task swapper.

The program has five companion files. DOSSHELL.COM is used to start DOSSHELL.EXE. DOSSHELL.HLP is a data file that contains the text for DOSSHELL.EXE's help commands. As with other help files, this one must be in the current directory or in a directory pointed to in your AUTOEXEC.BAT file's PATH command (otherwise, MS-DOS can't display the help file). DOSSHELL.GRB and its related file, DOSSHELL.VID, are data files that DOSSHELL.EXE uses to configure standard monochrome, CGA, EGA, and VGA monitors and graphics boards so that they work with the DOS shell. DOSSHELL.INI is a configuration file that stores settings that control the appearance of the DOS shell. (Available in MS-DOS 5 and later.)

DOSSWAP.EXE is the MS-DOS task swapper; it lets you

quickly jump between applications. This program is used internally by DOSSHELL.EXE; you can't invoke it from the DOS command line. (Available in MS-DOS 5 and later.)

DOSUTIL.MEU contains the information that DOS 4.x's shell program uses when it displays its Utilities menu. (Available in MS-DOS 4.x.)

DRIVER.SYS lets your computer system use external drives (these may be floppy, hard, or tape drives) or nonstandard hard drives. To use DRIVER.SYS, you must add the appropriate DEVICE command to your CONFIG.SYS file. The parameters you specify tell DOS how to support the drive. In addition, DRIVER.SYS lets you assign an additional drive letter to a single floppy drive so that you can copy files from one floppy disk to another using that drive. (Available in MS-DOS 3.2 and later.)

E
EDIT.COM, DOS's full-screen text editor, is a more intuitive alternative to the venerable line editor, EDLIN.COM. Its most useful features include pull-down menus, the ability to perform block moves, a search-and-replace facility, and on-line help. A companion file, EDIT.HLP, is a data file containing the text for the help feature. (Available in MS-DOS 5 and later.)

EDLIN.COM, renamed EDLIN.EXE starting with version 5, is a line-oriented text-file editor. If you take the time to learn six of its 14 editing commands, you can edit or create batch files and CONFIG.SYS. If you have version 5 or later, EDIT.COM is a better choice for this task. (Available in MS-DOS 1.25 through 5 and on the MS-DOS 6 Supplemental disk.)

EGA.CPI contains the information necessary for displaying national-language character sets on EGA and VGA monitors. You must use the MODE command to load the proper character set (code page) into memory from EGA.CPI. (Available in MS-DOS 3.3 and later.)

EGA.SYS is a driver program that saves and restores the screen display. If you use the DOS shell's task swapper, and your system includes an EGA monitor, you must use the command DEVICE=EGA.SYS to install this file in your CONFIG.SYS file. (Available in MS-DOS 5 and later.)

EMM386.EXE, a memory manager for DOS's upper memory area (UMA), has a number of capabilities. Chief among them is its ability to make your system's extended memory simulate expanded memory, a useful trick when you have a program that automatically uses expanded memory when no room remains in conventional memory. EMM386.EXE also gives users with 80386 and

80486 systems access to UMA, letting them load programs and device drivers into this area to make more room in conventional memory for DOS applications. To use these features, you must add a DEVICE command to your CONFIG.SYS file. (Available in MS-DOS 5 and later.)

EXE2BIN.EXE is a utility that lets you convert an executable file in the EXE format to the COM format. For the conversion to be successful, the EXE program must follow the programming conventions for a COM file. (Available in MS-DOS 2.0 through 5 and on the MS-DOS 6 Supplemental disk.)

EXPAND.EXE is a file-decompression utility. Most of the files on the installation and update disks for version 5 and later are stored in compressed format. During installation, SETUP.EXE automatically decompresses the files. If you later want to retrieve a compressed file (one designated with an underline character [_] in the file extension), you must invoke EXPAND first. (Available in MS-DOS 5 and later.)

F
FASTHELP.EXE is the system file responsible for displaying DOS 6's concise help information. When you type FASTHELP, the program summarizes the workings of DOS's internal and external commands. When you type FASTHELP and a command name (FASTHELP DIR), you receive a summary of the command's syntax. (Available in MS-DOS 5 and 6.)

FASTOPEN.EXE stores a hard drive's directory information in memory so that DOS can open files faster. A memory-resident program, FASTOPEN saves DOS from having to read in several directories from disk when you open files that have long pathnames. (Available in MS-DOS 3.3 and later.)

FC.EXE is a more capable file-comparison utility than COMP.COM, which comes with PC-DOS and some MS-DOS versions. FC compares binary and text files line by line and doesn't give up immediately if the files you're comparing have different lengths. When it is examining two files that are similar and encounters an area in which the files no longer match—because of added or deleted lines—FC.EXE also is smart enough to continue to compare them. In this case, the utility searches for a point where the files start to match again. Another of FC.EXE's capabilities is that it can ignore differences in upper- and lowercase characters, blanks, tabs, and empty lines. (Available in MS-DOS 2.0 and later.)

FDISK.COM, renamed FDISK.EXE starting with version 5, takes care of the second step in hard drive initialization. After using a low-level format program to put tracks and sectors on a drive, you use FDISK to divide

the disk into partitions, each of which you must format. (You may not use FDISK with IDE drives.)

Partitioning a disk lets you do such things as put the Unix operating system in one partition and DOS in another. Recent versions of DOS use partitioning to divide large hard drives into volumes, each with a different drive letter. Version 5 and later support disk partitions as large as 2 gigabytes. Partitioning with FDISK destroys existing data on the drive that you're partitioning. (Available in MS-DOS 3.2 and later.)

FILESYS.EXE is one of two files that provide support for IBM's LAN 1.3. The other file is IFSFUNC.EXE. (Available in PC-DOS 4.x.)

FIND.EXE searches a text file, finding and displaying lines that contain the string of characters you specify. One of three DOS filter programs (the others are MORE and SORT), FIND is especially useful in batch files. In version 5 and later, FIND gives you the option of ignoring the case of the characters for which you are looking. (Available in MS-DOS 2.0 and later.)

FORMAT.COM prepares new disks or hard drives so that you can store files. Formatting creates blank tracks and sectors to hold files, locks out defective areas, creates the directory structure, and—if you wish—installs the DOS system files. FORMAT initializes floppy disks from start to finish but creates only the directory system on hard drives. Initializing a hard drive usually requires that you run two other programs first: a low-level format program and FDISK. (You may not use FDISK with IDE drives.)

With version 5 and later, unless you use the /U switch to perform an unconditional format, you can use UNFORMAT to undo formatting. (Available in MS-DOS 1.25 and later. Beginning with DOS 3.0, FORMAT asks for confirmation before reformatting your hard drive.)

G

GORILLA.BAS, a computer game written in QBasic, is one of several demonstration Basic programs included in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.

GRAFTABL.COM loads the extended character set (ASCII codes 128–255) into memory so that you can use them in the CGA graphics modes. You probably won't need GRAFTABL.COM very often, but it might be time to learn how to use it if, for instance, a Basic program you're using doesn't display the IBM frame symbols properly. (Available in MS-DOS 3.0 and later and on the MS-DOS 6 Supplemental disk.)

GRAPHICS.COM lets you dump graphics screens to your printer using the Shift-PrtSc key combination. GRAPHICS.COM is a memory-resident program that contains

the routines to make IBM and compatible printers reproduce graphics. Some computer manufacturers add support for their companies' printers to the GRAPHICS.COM they ship with their machines. (Available in MS-DOS 3.2 and later and PC-DOS 2.0 and later. MS-DOS 5 and later include a number of new switches to accommodate EGA and VGA displays, as well as popular printers.)

GRAPHICS.PRO contains IBM printer information for GRAPHICS.COM. (Available in MS-DOS 5 and later.)

GWBasic.EXE is the version of GW-Basic included in MS-DOS 3.0 through MS-DOS 4.x.

H

HELP.COM is the system file responsible for displaying DOS 6's complete help listing. It offers detailed descriptions of syntax as well as usage notes and example commands. Typing HELP brings up a menu of internal and external commands; typing HELP and the command name (HELP DIR), or by typing the command name followed by a slash and a question mark (DIR /?) brings up the opening help screen for the command. Do not delete QBASIC.EXE if you intend to use HELP.COM—the program requires QBasic.

HELP.HLP is a data file used by HELP.COM. (Available in DOS 6.)

HELP.EXE is the MS-DOS 5 equivalent of MS-DOS 6's FASTHELP.EXE. (Available in MS-DOS 5.)

HIMEM.SYS, a device driver program that manages use of your computer's extended memory (including the high memory area [HMA]), prevents two programs from using the same area of memory simultaneously. To use HIMEM, you must install it by adding a DEVICE command to your computer's CONFIG.SYS file. HIMEM must precede other device commands that use extended memory, including SMARTDRV.SYS (called SMARTDRV.EXE in MS-DOS 6), RAMDRIVE.SYS, and EMM386.EXE. (Available in MS-DOS 5 and later.)

I

IFSFUNC.EXE is one of two files that support IBM's LAN 1.3. The other file is FILESYS.EXE. (Available in PC-DOS 4.x.)

INTERLNK.EXE, when used with its companion utility INTERSVR.EXE, lets you establish a rudimentary client-server link via the serial or parallel ports of two PCs. You connect a null-modem cable between the PCs, load INTERSVR.EXE as a device driver on the server, then run INTERLNK.EXE on the client. You can control the server's disk drives directly from the client PC,

moving data at rates as high as 115.2 kilobytes per second. (Available in MS-DOS 6.)

IO.SYS doesn't appear in any DOS directory (nor does its companion file, MSDOS.SYS), but this invisible system file must be in the root directory of your boot disk or DOS refuses to run. (If you have PC-DOS, the files are called IBMBIO.COM and IBMDOS.COM.) DOS adds IO.SYS and MSDOS.SYS to the root directory when you format a disk using the /S parameter or if you use the SYS command. Together with COMMAND.COM, IO.SYS, MSDOS.SYS, and DBLSPACE.BIN (in DOS 6) constitute DOS as we know it. (Available in MS-DOS 1.25 and later.)

J

JOIN.EXE makes one disk masquerade as a subdirectory of another disk. JOIN.EXE temporarily grafts the directory structure of the joined drive into any empty subdirectory you specify. If you have an application that must have all of its files on one disk, but you need to access files on another drive, then join the other drive to an empty subdirectory and access the files through the subdirectory. Don't use SUBST, ASSIGN, or DOS commands such as FORMAT and BACKUP with drives affected by JOIN. (Available in MS-DOS 3.0 through 5, and on the MS-DOS 6 Supplemental disk.)

K

KEYB.COM replaces the existing keyboard translation table (the default table is in ROM) with that for another language. MODE does the same thing for your display and printer. (Available in MS-DOS 3.2 and later.)

KEYBOARD.SYS is a data file that holds translation tables for different national keyboard layouts. KEYBOARD.SYS isn't a device driver; it works with the KEYB.COM program. (Available in MS-DOS 3.3 and later. Earlier versions of DOS keep this information in RAM.)

L

LABEL.COM, renamed LABEL.EXE starting with version 5, lets you name or rename a disk or hard drive volume. Before this feature was added to DOS, you could name disks only when you formatted or reformatted them. (Available in MS-DOS 3.1 and later.)

LCD.CPI contains information to support national-language character sets on the IBM PC Convertible display. You must use the MODE command to load the desired character set (code page) into memory from this file. (Available in MS-DOS 3.3 through 5 and on the MS-DOS 6 Supplemental disk.)

TIP NIXING NUM LOCK

Unless you've upgraded to DOS 6, which offers a NUMLOCK=OFF command, you probably find yourself wishing you could turn off the Num Lock key at start-up. This DEBUG script, RESETNL.SCR, creates a short program that does just that.

After typing in the listing, invoke the following command at the DOS prompt to create the program:

```
DEBUG < RESETNL.SCR
```

You then can invoke RESETNL in your AUTOEXEC.BAT file to turn off Num Lock at bootup.

RESETNL.SCR is a DEBUG script that creates **RESETNL.COM**, a program that deactivates the Num Lock key.

```
N RESETNL.COM      ;Name program
A 100              ;Start assembly
XOR AX,AX          ;Zero AX register
MOV ES,AX          ;Point to BIOS data segment
MOV AL,20          ;Bit 5 mask
ES:                ;Segment override
XOR [417],AL       ;Toggle Num Lock bit
INT 20             ;Exit to DOS

RCX                ;Set CX to write 13 bytes
0D
W                  ;Write them to disk
Q                  ;Quit DEBUG
```

LINK.EXE is a programmer's tool used to create an executable file from the intermediate code produced by assemblers and compilers. (Available in MS-DOS 1.0 through 5, and on the MS-DOS 6 Supplemental disk.)

LOADFIX.COM ensures that a program not designed to run within the first 64K of your computer's conventional memory loads above the 64K address mark. Use this command when DOS displays the error message "Packed file corrupt." The error is most likely to occur after you relocate device drivers and memory-resident programs into the UMA, freeing the first 64K of conventional memory for use by DOS application programs. (Available in MS-DOS 5 and later.)

M

MEM.EXE provides information on your computer's memory. Used with the proper switches, it lets you see which programs and device drivers

are in memory, where they reside, how much memory each uses, and how much memory is free. MEM also can provide this information on expanded and extended memory. (Available in MS-DOS 4.1 and later.)

MEMMAKER.EXE analyzes your system hardware and then makes intelligent decisions about how best to use the UMA for storing device drivers and memory-resident programs. MEMMAKER experiments with various combinations and settings before loading as many programs as possible into your computer's UMA. The changes are recorded automatically in your system's AUTOEXEC.BAT and CONFIG.SYS files.

MEMMAKER.HLP, MEMMAKER.INF, and MEMMAKER.STS are support files for MEMMAKER.EXE. If you remove MEMMAKER.EXE from your hard disk, you also may remove these files. (Available in MS-DOS 6.)

MIRROR.COM creates a special deletion-tracking file that the UNDELETE and UNFORMAT commands use to improve their chances of recovering a file. UNDELETE and UNFORMAT are most effective if you load MIRROR into memory where it can maintain an up-to-date record of the files you've deleted. You install MIRROR.COM by invoking the command in your AUTOEXEC.BAT file. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

MODE.COM gives you control over certain aspects of setting up your printer, display, and serial ports. This overworked command picks up more duties with each DOS version. For example, MODE lets you redirect printing to a serial printer. However with version 5, you no longer have to rely on MODE to set up screen size; you can do this by using ANSI.SYS's /S switch at bootup. (Available in MS-DOS 1.0 and later. Under DOS 3.3 and later, MODE also manages character sets for international language support.)

MONEY.BAS, a QBasic demonstration program, is a personal finance manager that lets you enter account transactions and track your net worth. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

MONOUMB.386 is a system-configuration file that MS-DOS uses to determine whether an 80386 or later computer is using a monochrome graphics adapter. (Available in MS-DOS 6.)

MORE.COM is a program that you use with other DOS commands to display information one screen at a time. When you need to display a long text file using the TYPE command, for instance, you can add | MORE to the end of the command line. Doing so lets you scan the file page by page. (Available in MS-DOS 2.0 and later.)

MORTGAGE.BAS is one of several demonstration programs provided for GW-Basic and BasicA. It performs

mortgage calculations. (Available in PC-DOS 1.0 through 4.x.)

MOVE.EXE provides a safe way to copy groups of files from a source to a destination directory. After copying the files, MOVE automatically deletes the entries in the source directory. (Available in MS-DOS 6.)

MSAV.EXE is the MS-DOS version of Central Point Software's Anti-Virus, a utility that scans memory and disks for known viruses and safely cleans infected files. The program has several support files. The data file MSAVIRUS.LST contains descriptions of the viruses that MSAV.EXE recognizes. MSAV.HLP contains on-line help information for the program. MSAVHELP.OVL is a system overlay file used by MSAV.EXE. (Available in MS-DOS 6.)

MSBACKUP.EXE, the MS-DOS version of Symantec Corp.'s The Norton Backup program, lets you archive files on your hard disk by saving them to a series of floppy disks. This program replaces the backup program provided with earlier MS-DOS versions and is easier to use than its predecessor. MSBACKUP requires two supporting help files—MSBACKUP.HLP and MSBCONFIG.HLP—as well as six overlay files—MSBCONFIG.OVL, MSBACKUP.OVL, MSBACKDB.OVL, MSBACKDR.OVL, MSBACKFB.OVL, and MSBACKFR.OVL. (Available in MS-DOS 6.)

MSCDEX.EXE is a program that lets you operate CD-ROM drives under MS-DOS. You may load it by invoking the command at the DOS prompt or by including an MSCDEX command in your AUTOEXEC.BAT file. You also must add to your CONFIG.SYS file a DEVICE command that loads the device driver program provided by the manufacturer of your CD-ROM drive. You may not load MSCDEX.EXE after starting Windows. (Available in MS-DOS 6.)

MSD.EXE is the Microsoft Diagnostics (MSD) utility, a program that gathers and displays technical information about your computer—the type of CPU, BIOS, hard drive, and so on that is installed in your system. (Available in MS-DOS 6.)

MSHERC.COM is a screen display driver that lets DOS programs operate with a Hercules graphics adapter. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

MSTOOLS.DLL is a Windows 3.x dynamic link library (DLL) file, a file containing modules that are loaded when an application needs them. MSTOOLS is used with MWAV.EXE, the Windows 3.x version of Central Point Software's Anti-Virus utility, and with MWUNDEL.EXE, a program that lets Windows 3.x users restore files that were erased accidentally. (Available in MS-DOS 6.)

MWAV.EXE is the Windows 3.x version of Central Point Software's Anti-Virus, a utility that scans memory and disks for known viruses and cleans infected files. It requires numerous support files. **MWAVTSR.EXE** is a memory-resident program that monitors memory and disk drives for signs of virus activity; **MWAV.HLP** is the on-line help file; and **MWAV.INI** is a program initialization file that stores setup data. **MWAVABSI.DLL**, **MWAVDLG.DLL**, **MWAVDOSL.DLL**, **MWAVMGR.DLL**, **MWAVSCAN.DLL**, and **MWAVSOS.DLL** are DLL files for Windows 3.x. (Available in MS-DOS 6.)

MWBACKUP.EXE is the Windows 3.x version of Symantec's The Norton Backup, a utility that lets you archive to a series of floppy disks all or some of the files on your hard disk. Its support files, **MWBACKF.DLL** and **MWBACKR.DLL**, are Windows 3.x DLL files. **MWBACKUP.HLP** is **MWBACKUP.EXE**'s on-line help file. (Available in MS-DOS 6.)

MWUNDEL.EXE lets Windows 3.x users restore files that were erased accidentally. For further details on how this program works, see the entry for **UNDELETE.EXE**. The program's companion file, **MWUNDEL.HLP**, is an on-line help file. (Available in MS-DOS 6.)

N

NETWORKS.TXT is a text file that tells you how to set up your network (LAN) to work with MS-DOS 6.

NIBBLES.BAS is a demonstration game program written in QBasic. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

NLSFUNC.EXE enables the change code page command, **CHCP**, and provides national-language character-set information to programs that are running. **NLSFUNC.EXE** is memory resident. (Available in MS-DOS 3.3 and later.)

O

OS2.TXT contains important information on how to set up IBM's OS/2 operating system to work with MS-DOS 6. (Available in MS-DOS 6.)

P

PACKING.LST is an ASCII text file provided with all DOS versions. It contains a complete list of the programs and data files on the system disks. (This file is available on all MS-DOS system disks shipped by Microsoft.)

PCIBMDRV.MOS and its companion mouse drivers, **PCMSDRV.MOS** and **PCMSPDRV.MOS**, let you use an IBM PS/2 mouse or Microsoft's serial or bus mouse with PC-DOS 4.x's shell program. (Available in PC-DOS 4.x.)

POWER.EXE, an MS-DOS utility for portable computers, provides a means of conserving battery power when applications and hardware devices are idle. If your portable PC conforms to the Advanced Power Management (APM) specification, you can use this program to reduce power consumption by as much as 25 percent. If your portable is not APM compatible, your average power savings will be about 5 percent. (Available in MS-DOS 6.)

PRINT.COM, renamed **PRINT.EXE** starting with version 5, is DOS's print spooler. This memory-resident program lets you print text files in the background while you go on to other things. You can feed **PRINT** a list of files to print, provided they are stored in ASCII format or as print files created by an application. (Available in MS-DOS 2.0 and later.)

PRINTER.SYS lets IBM Proprinter and Quietwriter III printers (and compatibles) switch among foreign-language character sets (code pages). If your printer comes with a code-page information (CPI) file, it also can use **PRINTER.SYS** to do this. (Available in MS-DOS 3.3 and later and on the MS-DOS 6 Supplemental disk.)

PRINTFIX.COM disables the verification of a printer's status. You can delete this program from your DOS directory if you can use your printer successfully without it. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

Q

QBASIC.EXE, a modified version of Microsoft's Quick-Basic 4.0 package, includes a program editor and command interpreter. You should not delete this program if you intend to use the text editor **EDIT.COM**, which comes with MS-DOS 5 and later. **EDIT** doesn't work unless **QBASIC.EXE** is listed in your search path or is in the same directory as **EDIT**. **QBASIC.HLP** provides on-line help for the program. If you have Windows 3.x, DOS creates a third file, the initialization file **QBASIC.INI**, during setup procedures. (Available in MS-DOS 5 and later.)

R

RAMDRIVE.SYS lets you set aside a portion of RAM to be used as a fast disk drive. To create such a RAM disk (also called a virtual disk), you must install this device driver in **CONFIG.SYS**. You then can speed up file access time by copying to the RAM disk frequently used files and programs. Be aware, however, that RAM disks take memory (how much is up to you), and the files they hold disappear when you turn off your computer. (Available in MS-DOS 3.2 and later. **VDISK.SYS** is the PC-DOS RAM disk.)

README.TXT is a text file that provides information not covered in your DOS manual or on-line help. This is the first place you should look for assistance in resolving problems with hardware, Windows, a disk compressor, or memory management. In fact, you may want to print out the text file (it can run 25 pages or so) and keep it near your manual for reference. (Available in MS-DOS 5 and later.)

RECOVER.COM, renamed **RECOVER.EXE** starting with version 5, is a last-ditch recovery program that can save readable parts of a file with damaged sectors or pull off undamaged sections from a disk with a bad directory. **RECOVER** copies each section to another disk and gives it a numbered name. File fragments become separate files, subdirectories are saved as files, and files lose their association with directories. It's up to you to put the pieces together. Try **CHKDSK** first. (Available in MS-DOS 2.0 through 5 and on the MS-DOS 6 Supplemental disk.)

REMLINE.BAS lets **QBASIC.EXE** convert Basic source files created with other versions of Basic (**BAS** files) to its own format. (Available in MS-DOS 5 and on the MS-DOS 6 Supplemental disk.)

REPLACE.EXE makes it easy to replace a group of files with newer versions. The **REPLACE** command overwrites destination files with the source files you specify only if the filenames match. **REPLACE** can search all destination subdirectories and prompt you for approval on each file. It also can copy only those files that don't already exist in the destination directory. (Available in MS-DOS 3.2 and later.)

RESTORE.COM, renamed **RESTORE.EXE** starting with version 5, restores your files and directory structure in the event of a disk disaster, provided you made backup copies using **BACKUP.COM** or **BACKUP.EXE**. Because **BACKUP** copies files in a format that preserves directory structure, only **RESTORE** can put them back onto your hard drive. (Available in MS-DOS 2.0 through 5 and on the MS-DOS 6 Supplemental disk. In version 6, **MSBACKUP** handles both backing up and restoring files.)

S

SELECT.COM formats and creates a bootable DOS disk containing **CONFIG.SYS** and **AUTOEXEC.BAT** files that set up the time and date displays and the keyboard layout for the country you specify. When you boot from this disk, it sets up your computer for the appropriate country. (Available in PC-DOS 3.0 through 3.3 and in some MS-DOS versions. Be careful: With PC-DOS 3.2 and 3.3, **SELECT.COM** works on hard disks, reformatting them as it goes.)

SELECT.EXE is the PC-DOS 4.x version of **SELECT.COM**. Teamed with its companion files, **SELECT.DAT**, **SELECT.HLP**, and **SELECT.PRT**, **SELECT.EXE** provides you with a full-screen utility that not only puts DOS on a floppy disk or hard disk but that also can update an older version of PC-DOS without destroying files already on a hard disk. No longer just for setting up national-language support, this version of **SELECT** configures your PC for optimal performance and sets up PC-DOS 4.x's operating shell. (Available in PC-DOS 4.x.)

SETVER.EXE is a memory-resident program that sets the MS-DOS version number DOS reports to an application program. Some programs check for a particular DOS version before they attempt to start. If DOS passes an incorrect version number to a program, it may refuse to run. **SETVER** maintains a data file that lists version-sensitive programs and the appropriate DOS version. If your program refuses to start, add its name and DOS version to the list. Thereafter, DOS 5 and later will pass the required version number to the program instead of its own. (Available in MS-DOS 5 and later.)

SHARE.EXE provides DOS with file- and record-locking, making it safe for several programs to share files. If you're on a network, you may find **SHARE.EXE**, which is memory resident, in your **AUTOEXEC.BAT** file. With DOS 4.x, you may need **SHARE** to access hard disk volumes larger than 32MB. (Available in MS-DOS 3.0 and later.)

SHELLB.COM and **SHELLC.EXE**—with their companion data files, **SHELL.ASC**, **SHELL.CLR**, **SHELL.HLP**, and **SHELL.MEU**—provide an integrated system of menus aimed at making it easier for you to perform disk operations and run application programs under DOS. (Available in PC-DOS 4.x.)

SIZER.EXE is a program used by **MEMMAKER.EXE** during memory optimization. The program is not intended to be started from the DOS command prompt. (Available in MS-DOS 6.)

SMARTDRV.SYS, replaced by **SMARTDRV.EXE** in MS-DOS 6, creates a disk cache, a storage area in memory that can improve significantly the performance of most programs that frequently access your computer's hard disk. By default, **SMARTDRV.SYS** installs the disk cache in your computer's extended memory, but you can use the **/A** switch to install it in expanded memory. To install **SMARTDRV**, you must add a **DEVICE** command to your **CONFIG.SYS** file. (Available in MS-DOS 5 and later. Not available in PC-DOS.)

SMARTMON.EXE is a Windows 3.x program that lets you change the way **SMARTDRV.EXE** operates. Among other

things, it lets you change the cache size and type and monitor the cache's hit rate, the frequency with which the cache contains the information that an application needs. Its companion file, SMARTMON.HLP, provides on-line help for the program. (Available in MS-DOS 6.)

SORT.EXE is a program you can use alone or with other DOS commands to sort lines in a text file. SORT includes options for sorting at a specified position within each line or in reverse alphabetical order. Used with the DIR command, SORT can display a sorted directory, but in version 5 and later this action is accomplished more easily with the DIR command's /O switch. (Available in MS-DOS 2.0 and later.)

SUBST.EXE lets you disguise directories as drives, which is useful if you have an old workhorse application that doesn't support subdirectories. By substituting a drive letter for a directory path, you can trick an application into working with files in other subdirectories. If you need access to many directories, you may have to increase the number of available drive letters by adding a LASTDRIVE command to CONFIG.SYS. SUBST doesn't get along with certain DOS commands. (Available in MS-DOS 3.1 and later.)

SYS.COM copies COMMAND.COM plus the three invisible system files, IO.SYS, MSDOS.SYS (IBMBIO.COM and IBMDOS.COM in PC-DOS), and DBLSPACE.BIN, to a disk to make it bootable. You may use SYS to upgrade the DOS version on your hard drive and make some commercial program disks bootable. (Available in MS-DOS 1.25 and later.)

TREE.COM presents you with a skeleton of your subdirectory structure, a boon if you can't remember in which branch of your tree a particular subdirectory resides. When you invoke TREE, the directories scroll by quickly, so redirect output to your printer by typing *TREE directory > PRN* or use MORE to display the output one screen at a time. (Available in MS-DOS 3.2 and later.)

UNDELETE.EXE provides a simple way to restore files that you erased with the DEL command. When you delete a file, DOS doesn't delete the data in the file; instead, it marks the file as deleted and the data the file contained remains on disk until DOS requires its space to record another file. As a result, you stand the best chance of recovering a file if you make an attempt to undelete a file immediately after deleting it. (Available in MS-DOS 5 and later. Under MS-DOS 5, a companion program, MIRROR.COM, helps you keep track of deleted files. Under MS-DOS 6, deletion-tracking capability is incorporated

into UNDELETE. You may ask DOS to use a file to record the location of deleted files or ask it to set up a directory called \SENTRY that stores your most recently deleted files.)

UNFORMAT.COM, another DOS 5 and later recovery program, provides a way to restore the directory structure of a hard or floppy disk that was reformatted or restructured accidentally with the RECOVER command. UNFORMAT also can rebuild a corrupted hard disk partition table. It works only with local drives, which means you can't use it to rescue files from drives that are part of a local area network. (Available in MS-DOS 5 and later.)

V
VDISK.SYS is a RAM-disk program that performs the same functions as RAMDRIVE.SYS. (Available in PC-DOS 3.0 and later.)

VFINTD.386 is the driver that makes MWBACKUP.EXE work. (Available in MS-DOS 6.)

VSAFE.COM is the DOS version of a memory-resident utility that monitors your programs for signs of virus-like behavior. To protect your system immediately upon start-up, you must load the program in your AUTOEXEC.BAT. (Available in MS-DOS 6.)

X
XBIO.S.OVL, an extension to the AT BIOS that is used by MS-DOS during hard-disk management tasks, resolves hardware compatibility problems that arise with some PC systems. (Available in MS-DOS 6.)

XCOPY.EXE, a more capable version of the COPY command, makes it easier and faster to copy multiple files. XCOPY can copy entire directories, creating destination subdirectories if necessary, and select source files from subordinate subdirectories. Because it first must load from disk (COPY is part of DOS and therefore resides in memory), XCOPY isn't worthwhile for copying individual files. (Available in MS-DOS 3.2 and later.)

XMA2EMS.SYS is a device driver that lets you take advantage of the Lotus/Intel/Microsoft Expanded Memory Specification (LIM EMS 4.0) on IBM memory-expansion hardware. Don't use this program unless you have software that takes advantage of expanded memory. (Available in PC-DOS 4.x.)

XMAEM.SYS is a device driver that, when loaded before XMA2EMS.SYS, lets you emulate LIM EMS 4.0 in the extended memory of an IBM 80386-based computer. (Available in PC-DOS 4.x.) ■

Start-Up Files for a Perfect Fit

Creating CONFIG.SYS and AUTOEXEC.BAT files to suit your work habits is simple and can help you work more productively.

by Dave Rowell

Like your favorite clothes, your computer should fit you well. You can ensure a good fit by tailoring DOS's start-up files, CONFIG.SYS and AUTOEXEC.BAT, to suit the occasion. And you needn't be a computer wizard to do it. I'll show you how, by creating or modifying these files, you can improve disk-access speeds, expand the usefulness of your system, and save keystrokes every time you boot up.

You may not have noticed them, but CONFIG.SYS and AUTOEXEC.BAT files probably reside in the root directory of your boot disk already. Perhaps the office computer guru or your computer retailer put them there. Recent versions of DOS and some application programs also create these files during installation.

Not every computer comes equipped with these files, however. To find out whether you have CONFIG.SYS or AUTOEXEC.BAT on your system, look at the files in the root directory of your boot drive. If you find you have the files and want to refer to them as you read on, use a text editor to print them. And before you make any changes to them, take a moment to copy the files to a floppy disk. That way, you can experiment without fear of making an irreparable mistake. If you don't find them, that's fine.

CONFIG.SYS and AUTOEXEC.BAT are text files, so you can create or edit them with any word processor or text editor that saves files in ASCII format. (If you have DOS 5,

its full-screen editor, Edit, is eminently suitable. The Edlin line editor that comes with earlier versions of DOS also will do in a pinch.) You simply open the file or create a new one, type in your instructions, and save the file to the root directory of your boot disk. During bootup, DOS reads the list of commands in each file—the text—and acts on them one by one. Your system processes CONFIG.SYS after it loads DOS but before it loads the DOS command processor, COMMAND.COM. In turn, COMMAND.COM runs AUTOEXEC.BAT, if it finds it. Let's begin with CONFIG.SYS, because it's first in line.

CONFIG.SYS and the Big Three

The CONFIG.SYS commands set up certain system parameters and load programs—device drivers—that let DOS use a nonstandard add-on, such as a mouse or a tape drive. DOS provides a collection of commands specific to CONFIG.SYS, but most are useful only for special situations. I'll concentrate on the big three: BUFFERS, FILES, and DEVICE. The following typical CONFIG.SYS file contains all of them:

Note: This article provides a primer on CONFIG.SYS and AUTOEXEC.BAT files that is suitable for users of all DOS versions. It does not, however, discuss significant changes introduced in DOS 6. For information on recent modifications to DOS's start-up procedures, see "The DOS 6 Crash Course" by Dan Gookin, page 4.


```
BUFFERS=20
FILES=20
DEVICE=C:\MOUSE\MOUSE.SYS
DEVICE=C:\DOS\RAMDRIVE.SYS
```

BUFFERS and FILES set values that affect how DOS handles disk files. The BUFFERS setting can make a big difference in how fast your drives work. When you set a value for FILES, you tell DOS how many files your application programs can have open at one time. DOS uses the DEVICE command to extend its repertoire of add-on hardware. The two DEVICE commands here load in driver programs for a mouse and a RAM-disk program that comes with DOS. The CONFIG.SYS command syntax remains constant: the command first, an equal sign second, and then the setting. (Actually, you may substitute a space, tab, or semicolon for the equal sign, and you

can vary the order of the commands.)

Some programs' installation procedures create or modify a line in your system's CONFIG.SYS file; others may replace your existing CONFIG.SYS file. Watch out for this when you use a new application—problems may crop up. Always make a backup copy of your AUTOEXEC.BAT and CONFIG.SYS files before installing a new program.

Speed Up with BUFFERS

Everyone should use the BUFFERS command to improve DOS's limited disk-caching capability and thus the efficiency of reading from and writing to disk drives. To understand why this is so, it helps to know how buffers work.

When a program requests a chunk of data from a disk, DOS first copies the data from the appropriate

disk sector into a holding area in memory. These intermediate storage areas, or buffers, are the same size as a disk sector—512 bytes. Once the sector is in a buffer, DOS can pull out the desired data and deliver it to the program that requested it. If the data chunk is larger than a sector, DOS pulls in several sectors.

DOS keeps the most recently used disk sectors in buffers. With enough buffers at its disposal, DOS works more efficiently, because it's likely that it can grab information from a buffer in memory rather than take the time to read it again from disk. Reducing the number of disk operations saves time.

The most efficient BUFFERS setting for your system depends on the capacity of your hard disk, the speed of your computer, and how your programs use files. (If your system relies on disk-caching software—such as SMARTDRV.SYS, which is available in DOS 5 and later—the optimum settings probably will be lower.) In general, systems with high-capacity hard drives and fast processors should use more buffers than slower systems with small hard drives. An XT clone with a 20MB hard drive might work best with 12 buffers. A faster AT with a 40MB hard drive may do best with a setting of 20, while a speedy 386 or a 486 with an 80MB or larger hard drive might benefit from as many as 40 buffers.

TIP SNOOPING DUPES

If you want to locate the filenames common to two directories, the batch file FINDDUPS.BAT can help. When you invoke the program, you must supply the complete pathnames of the two directories you want to compare. FINDDUPS displays a header listing the two pathnames and then lists the filenames common to both directories. (When typing in the pathnames, don't include trailing backslashes; the batch file adds them for you.) To compare the two directories \WORDPRO\DOCS and \PROJECT\MARCH, for example, type:

```
FINDDUPS \WORDPRO\DOCS \PROJECT\MARCH
```

You can compare directories on different drives by including drive designations in the pathnames, but be sure that the first pathname is on the current drive. If, for instance, you are logged onto drive C and want to compare the \BASIC directory on that drive with the root directory of drive A, type:

```
FINDDUPS \BASIC A:
```

For simplicity, the program returns to the root directory after conducting the comparison. If you're clever, you can add lines to save the original path and return to it when the program finishes. FINDDUPS works with DOS 3.x and later. Under DOS 2.x, the IF EXIST statement doesn't check for files outside the current directory.

FINDDUPS.BAT lists the filenames common to two subdirectories. You must supply two complete pathnames, omitting trailing backslashes.

```
ECHO OFF
REM Lists files common to two directories
IF %2==. GOTO HELP
IF %1==. GOTO HELP
ECHO Files common to %1 and %2:
CD %1
FOR %%A IN (*.*) DO IF EXIST %2\%%A ECHO %%A
GOTO END
:HELP
ECHO You must provide two complete pathnames to
ECHO begin the comparison.
ECHO Example: FINDDUPS pathname1 pathname2
:END
CD \
```


The types of programs that benefit most from more buffers are databases, compilers, and other applications that repeatedly access the same data when working with files. Spreadsheets and other programs that read a data file from disk, work with the information in memory, and then save the data back to disk benefit only slightly from more buffers.

Hard disks that contain several levels of subdirectories also work faster with more buffers. To find a file on a disk, DOS must first load the proper directory from disk into memory. When DOS accesses a file nested several subdirectories down, it often must start at the root directory and then read through each subdirectory in the path until it locates the file. If the subdirectories are stored in buffers, because you used them in a previous operation, DOS finds the file much faster.

You'll have to test your own applications to find the best **BUFFERS** setting for your system. Start with the guidelines I've recommended to test how fast your important programs work with your disk drives. (If you need a stopwatch to judge speed, the difference isn't significant.) Go five buffers either way, and see if you notice a change in the speed of disk-intensive operations or the number of times your hard disk light comes on. Be aware, though, that a change of one buffer can sometimes make a marked difference.

After you reach a certain number of buffers, adding more yields little improvement, and each additional buffer costs you 532 bytes of RAM. Creating the maximum of 99 buffers takes 51K of memory.

Opening FILES

The second entry in the example **CONFIG.SYS** file contains the **FILES** command. This command tells DOS to reserve the space it needs (59 bytes per file in DOS 5) to keep track of each file a program opens. Although **FILES** doesn't provide any performance benefits, knowing how to set it can prevent the headaches that arise when DOS tells you that you have too many files or displays the equivalent message, "No free file handles."

If you can run all your applications and you don't see error messages, you're fine. If an error message appears, you must go into **CONFIG.SYS** and increase the **FILES** setting. Check the manual of the problem program for information on the appropriate setting. By default, DOS 5 sets **FILES** to 20, which is a high enough setting for the average system. If you use Microsoft Windows, a value of 30 is recommended. Each increment above the DOS default value of eight reduces available memory by only 59 bytes, so don't be stingy.

Your Own Devices

DOS has built-in routines to handle certain hardware. It knows how to read the keyboard, display information on screen, read from and write to standard disk drives, send data to the printer, and communicate through a serial port. If you want to hook up another type of de-

vice, you must provide DOS with the proper routines (device drivers) and use the **DEVICE** command in **CONFIG.SYS** to load them. Hardware manufacturers usually provide these routines.

Device drivers are a form of memory-resident programs. Once DOS loads a driver into memory, it stays there ready to mediate between DOS and a particular device. On average, a driver program occupies several thousand bytes of memory.

You don't have to keep driver programs in your root directory. You can keep them in a subdirectory as long as the **DEVICE** line that loads the driver in **CONFIG.SYS** uses a full pathname as in the **CONFIG.SYS** file example.

DOS 2.x and later come with at least one device driver of their own: the **ANSI.SYS** program that lets you add color and cursor movement to DOS displays. Later versions of DOS usually come with a RAM-disk program—**VDISK.SYS** or **RAMDRIVE.SYS**—that uses part of memory to simulate a fast disk drive. With DOS 3.2 and later, you also get **DRIVER.SYS**, a program that lets you add external disk drives to your system. DOS 5 adds several new drivers. Among the most important are **EMM386.SYS**, an expanded-memory emulator, and the disk-caching program, **SMARTDRV.SYS**, mentioned earlier.

AUTOEXEC.BAT at Your Service

Like any other batch file, **AUTOEXEC.BAT** is a list of commands to DOS. Anything you can accomplish from the DOS prompt—execute DOS commands or run a program—you can accomplish by adding a line to **AUTOEXEC.BAT**. If you find yourself typing the same commands every time you turn on your computer, it's time to put an **AUTOEXEC.BAT** file in your root directory. From then on, DOS will execute those commands whenever you boot up or reboot. **AUTOEXEC.BAT** is a good place to load memory-resident programs, set the DOS screen prompt to your liking, or run the **MODE** command to configure a printer.

Some people do just one thing on their computers—run a word processor, for instance—and don't want to deal with DOS. For these users, a simple **AUTOEXEC.BAT** such as the following is ideal:

```
ECHO OFF
CD \WORDPRO
WORDPRO
```

The **ECHO OFF** command in the first line tells DOS not to display the remaining command lines as they are executed and keeps your screen from looking cluttered. The second line assumes that you keep your word processor and its documents in a subdirectory named **\WORDPRO**, which lies in the root directory of the boot disk. The **CD** command switches you to that directory so that DOS finds and executes **WORDPRO** in the last line.

This batch file works on a hard disk or a floppy disk. If you have a hard drive, you just turn on the power and

you're in the program. Putting this file on a bootable system disk containing your word processor accomplishes the same end.

If you store your applications on a hard disk and use several programs in a computing session, this shortened version of my AUTOEXEC.BAT file might help:

```
ECHO OFF
PROMPT $P$G
PATH=C:\BATCH;C:\DOS;C:\UTILITY
BIN\NOKEY
DAVE\FORMFEED
```

The PROMPT command in the second line makes the DOS prompt display the current directory path (\$P) and the greater-than symbol (\$G), so that you know in what subdirectory you are. PROMPT lets you do all sorts of interesting things. To learn such tricks as changing the color of the screen, see “ANSI.SYS: A DOS Treasure” on page 47.

DOS uses the information in the `PATH` command to find executable programs. To use it effectively, list the subdirectories (set off with semicolons) in which you keep the programs you use most often. You then can run any program listed in those subdirectories by sim-

ply typing the filename at the DOS prompt, even if you're in a different subdirectory.

The last two lines run memory-resident programs. FORMFEED, for instance, tells my printer to eject a page when I press a certain key combination. Because FORMFEED isn't one of the subdirectories mentioned in the PATH command, the last line includes the subdirectory name, \DAVE, and the filename.

Configuration Continued

AUTOEXEC.BAT also is a good place to use the DOS configuration commands. If you want to reproduce high-resolution graphics screens on your dot-matrix printer, you can run the DOS program GRAPHICS.COM from AUTOEXEC.BAT. Or you can use the MODE command to set up your printer. To activate a serial port printer on your computer, use an AUTOEXEC.BAT file such as the following:

```
ECHO OFF  
ECHO Configuring Serial Printer  
MODE COM1:12,,,P  
MODE LPT1=COM1  
PROMPT $D $T$H$M$S$P$G
```

With echoing off, DOS displays only the configuration message following the second ECHO command. The first MODE command sets up the serial port (COM1) with parameters for a particular serial printer. The next one tells DOS to send information to the serial port rather than to the printer port (LPT1).

The fancy PROMPT command displays the date (\$D) and time (\$T) and backspaces (\$H) six times to erase the seconds and hundredths of seconds from the time display. It then goes to the next line (\$_) and displays the current path (\$P) and the greater-than character (\$G).

These AUTOEXEC.BAT files barely scratch the surface. You can create more elaborate start-up batch files—even a system that lets you select your applications from a menu. (This is especially easy in DOS 6.) To pick up some batch-file tricks for your AUTOEXEC.BAT file, see “Batch-File Basics” on page 58.

You can use your CONFIG.SYS and AUTOEXEC.BAT files to set up a computer in many ways. Go ahead and experiment—even the simplest start-up files will reward your efforts. ■

TIP HOME, PLEASE

When you need to leave the directory you're working in, but you plan to return, DIRECTOR.BAT can help. It "remembers" the name of your present directory and can return you there from any directory on any drive. Before you leave the current directory, simply type DIRECTOR.

If `DIRECTOR.BAT` is stored in a subdirectory listed in your `PATH` statement, it saves the current directory. When you're ready, run `DIRECTOR.BAT` again, but this time include a parameter (if you use `H` for *home*, the command is `DIRECTOR H`), and you'll be back where you started. One caveat: If you change `DIRECTOR.BAT`'s name, the program doesn't work.

DIRECTOR.BAT remembers your current drive and directory so it can return you there later.

```
ECHO OFF
IF "%1"=="of" GOTO ICALLEDME
IF NOT "%1"==" " GOTO POPDIR
CTTY NUL
DIR DUMMY.$$$ | FIND "Directory of " > TEMP.BAT
CTTY CON
TEMP
GOTO END
:POPDIR
%HOMEDIR%\
CD %HOMEDIR%
GOTO END
:ICALLEDME
SET HOMEDIR=%2
DEL TEMP.BAT
:END
```


How to Resolve Conflicts with DOS

When DOS talks back, it's important to understand the lingo so that you can take appropriate action.

by Hardin Brothers

My computer is angry at me," the new computer owner complained to me over the phone, and he was only half joking. After finally gathering up the courage to experiment with his computer instead of blindly following instruction manuals, he had typed the word hello at the C:> prompt. When he saw the DOS message, "Bad command or filename," he took it personally.

You may never have felt so timid about your computer, but I'm willing to bet that the first time "Fatal error" appears on your screen, you will be more than slightly concerned.

Errors are a normal part of computing. Whenever DOS can't obey a command it receives from you or an application program, it reports an error. These DOS error messages can be criticized for being too terse, but each one is an attempt to tell you what went wrong and why. Once you are able to understand these messages, you'll view them as helpful guides rather than as insulting nuisances.

Because this is a short article, I don't have the room to describe in detail every error that DOS has the ability to report. However, the following explanations of common error messages should help you comprehend about what DOS is complaining. In addition, I've written them to assist you in taking the necessary corrective actions.

■ Bad Command or Filename ■ File Not Found

Unless you are a much more careful typist than I am, these are the error messages you'll see most often. They usually happen when you simply mistype something. But if you typed the command or a filename correctly, these messages are telling you that DOS can't locate the specified program or file.

Things to consider are: Is the correct disk in the disk drive? Use the DIR command to find out. Are you using the correct subdirectory? If the DOS prompt doesn't tell you the current subdirectory, type:

PROMPT \$P\$G

DOS uses PATH (version 2.x and later) and APPEND (version 3.2 and later) to look in other directories for application programs and data files. If you type PATH and APPEND, DOS tells you where it is looking. Check to see if the file is in one of those directories.

■ Volume in Drive A Has No Label

This message may appear at the beginning of a directory listing or if you type VOL. It isn't an error message; DOS simply is informing you that you have not assigned a name to a floppy disk or hard disk. You can give the disk a name when you format it (some versions of DOS require that you add /V to the FORMAT command) and change names with almost any disk utility. The LABEL command (DOS 3.1 and later) also lets you name or rename a disk. Generally, disk names are for your infor-

mation only, although a few applications read them to be sure that you are using the correct disks.

■ Insufficient Memory ■ Program Too Big to Fit in Memory

The meaning of these messages is clear. If your computer has only 640K of available RAM and your application won't run, your only so-

lution is to free more memory. You may be wasting memory in ways you don't realize. First, type CHKDSK or MEM to see how much memory DOS thinks is available. If the amount of free memory is startlingly low, one of three things may have happened:

- You left a program by "shelling" to DOS and forgot to return. You can

check to see if this is the source of the problem by typing EXIT. If you suddenly are back in a running application, you know that this is what happened.

- You have installed one or more memory-gobbling memory-resident utilities. You must unload the utilities, or reboot without them, to have enough memory for your program. If you can't live without pop-up utilities but also need your computer's full memory for application programs, perhaps you can load the utilities into expanded, extended, or upper memory (if you have it) or use a multitasking environment such as Quarterdeck Office Systems' DESQview.
- Occasionally, a hardware fault makes a block of memory invisible to DOS. Reboot your computer with a fresh backup of your DOS disk and invoke the CHKDSK command again. If the amount of memory available still is far smaller than the amount you have installed, it's time to arrange for service.

■ Errors Found, F Parameter Not Specified

CHKDSK gives you a disk and memory status report. Using it periodically helps to preserve the integrity of your directory structure. If you invoke CHKDSK and it finds errors on your disk, it asks if you want to fix them, but it doesn't make changes unless you invoke the command and add the /F parameter.

Most experienced DOS users type CHKDSK first to test a disk and then CHKDSK /F to fix any errors that are reported.

■ Cannot CHKDSK a SUBSTed or Assigned Drive ■ Directory Is Joined

DOS versions 3.1 and later provide a utility called SUBST. Versions 3.3 through 5 also provide ASSIGN and JOIN. These utilities let you create alternate names for directories and drives and link two directories. These are handy features, but they

TIP WHERE WAS I?

When you run an application, such as your word processor, you often want it to load the file you were working on at the end of the previous session. WP.BAT "remembers" the name of the file you used the last time you ran the batch file and runs your word processor—WordPerfect in this example—which in turn loads the file. By modifying the batch file, you can make it work for almost any application that accepts command-line parameters.

The syntax for invoking WP.BAT is as follows:

```
WP [filename] [option]
```

The two parameters are optional. If you provide a filename, WP.BAT first saves that filename for future use and then runs the word processor with the specified file. If you don't provide a filename, WP.BAT loads the last file you used. The option parameter lets you pass switches to the program. If, for example, you want to start a macro when you run WordPerfect, you may use a command such as this one:

```
WP /M-macro
```

If you modify WP.BAT to run with your software, you can add more parameters. You also must change the name of the directory following the CD command and replace references to WordPerfect with the name of your application.

WP.BAT runs an application using the parameters you provide. The next time that you run WP.BAT without parameters, it "remembers" which parameters you last used.

```
ECHO OFF
REM WP.BAT loads WordPerfect with a file and optional parameter.
REM Syntax: WP [filename] [option]
REM Defaults are the last file and last mode used.
CLS
C:
CD \WP
IF NOT %1==/ GOTO NEW
IF EXIST WPLAST.BAT GOTO LAST
ECHO Loading WordPerfect...
WP
GOTO END
:LAST
ECHO Loading WordPerfect with the last file used.
WPLAST
:NEW
ECHO Loading WordPerfect with file %1.
IF NOT %2==/ ECHO Option is %2.
ECHO WP %1 %2 > WPLAST.BAT
WP %1 %2
:END
CLS
```


confuse CHKDSK, and it reports an error instead of testing the integrity of your drive. To run CHKDSK, remove these utilities from memory or reboot without them.

■ Invalid Path, Not Directory, or Directory Not Empty

This DOS message covers a multitude of sins. If you see this message when trying to remove a subdirectory, you may have mistyped the directory name or failed to properly specify its path. It's more likely, however, that the subdirectory you want to remove still contains files. To protect you from accidentally erasing important files or the wrong subdirectory, DOS checks to make sure the subdirectory is empty. DOS cannot remove a subdirectory if it contains any files or subdirectories, because it would not know where to store those files.

To remove a subdirectory, you must first log into it and erase all of the files it contains. If it is empty, you should see only a single dot (.) and a double dot (..) when you invoke DIR. Then, change to the parent directory with the command CHDIR .. (or CH ..) and remove the directory by typing RMDIR (or RD) plus the directory name. If you still see the error message, the subdirectory may contain hidden files. Some programs write hidden files as part of a copy-protection scheme. You'll need an "unhiding" utility to remove the files. (With DOS 5 and later, you can use DIR's /AH parameter to list hidden files, change their hidden status with ATTRIB, and then delete the files.)

■ Invalid Parameter

■ Invalid Number of Parameters

Many DOS commands and application programs expect or accept information on the command line after the command name. For example, you can type DIR /P to see a directory one page at a time, and the COPY command expects to be told which files to copy. Each piece of additional information after the program or command name is

called a parameter.

If you type DIR /X, DOS doesn't understand the /X and tells you that you have typed an invalid parameter or switch. If you type COPY XXX YYY ZZZ, the COPY command thinks that you have specified three filenames and reports an invalid number of parameters, instead of trying to figure out what you may have meant. These messages are simply DOS's method of telling you that it doesn't understand what you typed.

■ Abort, Retry, Fail?

■ Abort, Retry, Ignore?

This is potentially the most dangerous error message. If you answer the question incorrectly, you can destroy or lose data. Well-designed application programs trap this error internally to prevent you from seeing it when they are running.

DOS asks this question when it tries to use a device, such as a disk drive, that is not ready. If the problem is obvious and you can easily fix it—by closing a drive door, for example—do so, and press R to have DOS retry the operation. Everything should proceed smoothly. Do not change disks at this point. Doing so scrambles the file allocation table (FAT) on the replacement disk.

If you can't fix the problem, the way you respond depends on what was happening when the error occurred. If you press I (for *ignore*) or F (for *fail*), the program that was running receives an internal error message from DOS and is given a chance to take corrective action.

If you press A (for *abort*), you are telling DOS to return to the DOS prompt. If an application program had any files open, they are left open, so you should run CHKDSK /F immediately to test the integrity of your disk's directory. It is possible that you will lose data.

It's safe to press A if you receive this error while a DOS command or utility is running. You should press I or F if you are running an application program. Some applications ignore the internal error messages they receive from DOS and continue

to try to access the same device. If repeatedly responding with I or F has no effect, you'll have to press A to return to DOS and accept any possible lost data (you also may want to find another program that knows how to handle DOS errors).

■ Insufficient Disk Space

This error message pops up at inopportune times. If you are copying a group of files (using a wildcard specification, such as *) to a disk that doesn't have room for all the files, you'll see this message part way through the copying process. If you then look at the disk's directory, you'll find that the file DOS was copying when the error occurred will appear with a length of zero. No harm has been done, but how do you know which files were copied and which weren't without comparing two directories? DOS copies files in the order in which they are listed in the directory. If you keep your directories sorted, you'll have no problem seeing which files were copied and which were not.

But if the directory from which you are copying isn't sorted, you still can get a list of the files that weren't copied. Turn on your printer and type:

```
DIR > PRN
```

to send a list of source files to your printer. Now look at a directory of the receiving disk and find the file with a length of zero. Of the files you specified for copying, the zero-length file and files below it in the printed directory weren't copied to the destination disk. You now have a printed list of the files that need to be copied to a new disk.

■ Stack Overflow

■ Internal Stack Overflow, System Halting

■ Cannot Load Command, System Halting

■ Divide Overflow

■ Fatal Error, System Halting

These five error messages, and others like them, are not the result of

anything you have done wrong but usually are caused by an unfortunate chain of events. Even if you are returned to the DOS prompt and the computer seems to be operating without problems, you should reboot your computer. If you can make one of these errors occur ev-

ery time you run a certain application program, try running the program without any memory-resident utilities installed. If that doesn't cure the problem, call the software publisher and provide exact directions for repeating the problem. You have found a bug that the com-

pany will want to correct.

■ Memory Parity Error

This message appears only in situations in which a problem has been detected in your computer's hardware. Once in a great while, a memory cell will change because of natural radiation. But if you see this message more than once a year, you should either move your uranium collection to another room or have your computer repaired. Some PC compatibles don't have memory parity checking built into their hardware. You'll never see this error with those types of machines.

Your computer stops itself completely when a memory error is detected; it forces you to reboot, destroying all data in memory. You may argue that this action is too drastic, and you'd much rather save your data with one bad bit than lose all of your work. But your computer can't tell whether the memory error it has encountered is in a block of data or is part of a program instruction. A bad instruction could cause the program to lose control, so your computer stops itself to prevent potential disaster, such as an accidental reformatting of your hard drive.

Several years ago, I worked with a system that had a single error message. Regardless of the problem, it always displayed the message "BAD" with no explanation. As I was learning to use the system and making many mistakes, I felt like a scolded puppy: Everything I did was BAD.

If you think of DOS's error messages as reprimands, you may feel BAD, too—or at least incompetent. But if you realize that DOS is trying to convey helpful information and explain what went wrong, you will soon see the error messages as informative rather than reproachful. The designers of DOS might deserve criticism for the terse and cryptic nature of some of the error messages, but not for their intent to guide you in the correct use of your computer. ■

TIP PICK A DAY, ANY DAY

The following batch file, DAY.BAT, determines the day of the week for any date and also demonstrates how to use Basic from a batch file without creating a separate Basic program file. The instructions for using DAY.BAT are in the batch file. If you use GW-Basic instead of QBasic, change the line following the second ECHO command to read as follows:

GWBASIC DAY.BAS

This program uses the Gregorian calendar and follows the Gregorian rule for leap years: All years evenly divisible by four are leap years, except for century years that are not evenly divisible by 400.

DAY.BAT takes a date and reveals the day of the week on which it will fall according to the Gregorian calendar.

```
ECHO OFF
IF "%3"==" " GOTO HELP
IF "%2"=="1" GOTO HELP
IF "%2"=="2" GOTO HELP
: The following ECHO statement is long. It starts with "ECHO"
: and ends by redirecting information to DAY.BAS.
ECHO CLS:PRINT "%1 %2 %3 is"(%1+%1\4-%1\100+%1\400+2.6*%2+1.2+%3) MOD
7"'sday" : SYSTEM > DAY.BAS
QBASIC /RUN DAY.BAS
DEL DAY.BAS
GOTO END
:HELP
ECHO This program uses the Gregorian calendar to find the day of the week
ECHO for any date. Although it accepts input for any year from A.D. 1
ECHO through A.D. 26000, the Gregorian calendar is accurate only to
ECHO A.D. 2800.
ECHO\
ECHO To find the day of the week for July 11, 1993, type:
ECHO\
ECHO DAY 1993 7 11
ECHO\
ECHO You must enter January as month 13 of the previous year, and February
ECHO as month 14 of the previous year. To interpret the output:
ECHO\
ECHO Sunday is 0'sday
ECHO Monday is 1'sday
ECHO Tuesday is 2'sday
ECHO Wednesday is 3'sday
ECHO Thursday is 4'sday
ECHO Friday is 5'sday
ECHO Saturday is 6'sday
ECHO\
ECHO For nonleap years, February 29 and March 1 return the same answer.
ECHO For leap years, they return sequential days of the week.
:END
```


New Tricks for An Old Command

COPY's capabilities go beyond duplicating files. Use it to salvage portions of an unreadable file, check a disk, and view the contents of a file.

by Lewis Rosenfelder

Time and time again, I've found that computer commands thought to be limited to one purpose can be used for many others. The DOS COPY command is a good example. Its primary function is to duplicate a file or group of files, but it can do much more than this. COPY can help you check a disk, repair damaged files, clean up a disk so that DOS finds files faster, and make corrections to file dates and times. It also works as a miniature word processor and stands in for other commands, overcoming their limitations in many situations. Before expounding on COPY's lesser known virtues, however, let me review the command's more obvious benefits.

File-to-File Copies

COPY lets you share your work. You can copy a spreadsheet, program, or letter onto a friend's or coworker's floppy disk or from a floppy disk onto another computer's hard disk. The following command, for example, will copy a 1-2-3 cash-flow projection file called CASHFLOW.WK1 from a hard disk in drive C to a floppy disk in drive A:

```
COPY C:CASHFLOW.WK1 A:
```

This sequence does the opposite, copying onto a hard

disk the cash-flow worksheet from a floppy disk (containing the file) in drive A:

```
COPY A:CASHFLOW.WK1 C:
```

COPY also helps you organize disks so you have the files you want, where you want them—the computer equivalent of moving furniture. If you have several letters to the same person on different disks or spread throughout your hard disk, you can use COPY to put them all on the same disk or subdirectory. Then the DEL command can free up the space the files occupied on the original disks or subdirectories.

If you accidentally create the file POLICIES.DOC in the root directory of your hard disk, for example, you can move it to a subdirectory named \MEMOS with this two-line command sequence:

```
COPY \POLICIES.DOC \MEMOS\POLICIES.DOC
DEL \POLICIES.DOC
```

DOS 6's new MOVE accomplishes this in one step, but the previous example works in all DOS versions.

COPY lets you use old projects to get a head start on new ones. Just copy and rename the appropriate files. Then start the program that uses the data and begin deleting, modifying, and adding information. Suppose, for instance, that a contract with Jones is to be the same as an earlier contract with Smith, except that you need to add a few provisions and change a few others.

To make a copy, type:

```
COPY SMITH.DOC JONES.DOC
```

Now start the word processing program, load JONES.DOC, and make the necessary alterations. SMITH.DOC remains unaffected.

Perhaps COPY's most important function is protecting work already done. If you have a duplicate of each file, mistakes are not as catastrophic: You can recopy from the original file. The DOS DISKCOPY command duplicates an entire floppy disk,

and BACKUP and DOS 6's MSBACKUP back up your entire hard disk. COPY, however, can be quicker and easier, because you can be more specific when you tell the computer what to do. On a hard disk, another easy way to back up files is to copy them to another subdirectory, or copy and rename them.

Suppose, for example, that your payroll program uses two files, PRMASTER.ABC and PRCHECKS.ABC, to hold payroll data. Before the payroll session, you can copy and rename both files:

```
COPY PRMASTER.ABC PRMASTER.BAK
COPY PRCHECKS.ABC PRCHECKS.BAK
```

If an error occurs while the payroll runs, the opposite COPY commands restore the originals:

```
COPY PRMASTER.BAK PRMASTER.ABC
COPY PRCHECKS.BAK PRCHECKS.ABC
```

Dozens of shortcuts and variations of file-to-file and disk-to-disk copying are available. For instance, you can copy a group of files, all of which have the extension ABC, in one

TIP G'DAY MATE

You can use your AUTOEXEC.BAT file to set up and run the programs you use regularly even if you don't run the same programs every day. On Mondays, for example, it could execute software to plan your week. The remainder of the week, it could start up your word processor.

AUTOEXEC.BAT can figure out what day it is by running a program named GETDAY.COM to obtain the day of the week from DOS. Only eight bytes long, GETDAY.COM returns a numeric code that your AUTOEXEC.BAT can interpret with the IF ERRORLEVEL command.

Use DEBUG to create GETDAY.COM, then type:

```
DEBUG < GETDAY.SCR
```

The other DEBUG script, GETDATE.SCR, creates a program that returns the day of the month. You can use this utility to automate monthly tasks, such as payroll and inventory.

The sample AUTOEXEC.BAT shows how to use GETDAY.COM or GETDATE.COM. To adapt the batch file for your use, replace the REM statements with the commands you need to run particular applications.

GETDAY.SCR creates GETDAY.COM, a program that gets the day of the week from DOS and returns it to a batch file as an ERRORLEVEL value.

```
N GETDAY.COM ;Name program
A 100 ;Start assembly
MOV AH,2A ;DOS function: get date
INT 21 ;Call DOS (returns day of week in AL)
MOV AH,4C ;DOS function: terminate with return code
INT 21 ;Call DOS (with return code in AL)

RCX ;Set CX to write eight-byte file
B
W ;Write file to disk
Q ;Quit Debug
```

GETDATE.SCR creates GETDATE.COM, a program that gets the day of the month from DOS and returns it to a batch file as an ERRORLEVEL value.

```
N GETDATE.COM ;Name program
A 100 ;Start assembly
MOV AH,2A ;DOS function: get date
INT 21 ;Call DOS (returns day of month in DL)
MOV AL,DL ;Move date in DL into AL register
MOV AH,4C ;DOS function: terminate with return code
INT 21 ;Call DOS (with return code in AL)

RCX ;Set CX to write 10 bytes (0A hexadecimal)
0A
W ;Write file to disk
Q ;Quit Debug
```

AUTOEXEC.BAT is a sample program that shows how you might use GETDAY.COM or GETDATE.COM to run different programs on different days of the week or on different dates.

```
ECHO OFF
GETDAY
IF ERRORLEVEL 5 GOTO CLEANUP
IF ERRORLEVEL 2 GOTO WORDPRO
IF ERRORLEVEL 1 GOTO PLAN
:PLAN
    ECHO Monday
    REM (Run planning software)
    GOTO EXIT
:WORDPRO
    ECHO Tuesday through Thursday
    REM (Run work processor)
    GOTO EXIT
:CLEANUP
    ECHO Friday
    REM (Run disk manager)
:EXIT
```


step by using an asterisk (*) as a wildcard character. In this example, DOS gives the copies the same filenames but replaces ABC with BAK:

```
COPY *.ABC *.BAK
```

You also can eliminate the destination specifier in many COPY commands. If the DOS system prompt says C:\>, and you want to copy all files from a disk in drive A, use the following command:

```
COPY A:*.*
```

(DOS assumes that drive C is the target drive.)

Checking a Disk

Perhaps you've found a bad file on a disk. You've started your word processor, and an important document you saved last month won't load. A "Disk media error" or "Sector not found" error confirms your fears. You made a backup, but what if the file on the backup disk is unreadable, too?

Fortunately, you can verify that a disk's data is readable. The common misconception is that you can use CHKDSK to verify the condition of a disk. CHKDSK checks information only in a disk's directory and file-allocation table (FAT). That is equivalent to a librarian checking the card catalog to find out whether the library is organized. To really know if the library's information is usable, the librarian would have to look at every page of every book on the shelves.

The not-so-obvious COPY command makes sure the files have no bad sectors:

```
COPY *.* NUL /B
```

The first part of the command means "copy all the files." You can use a variation such as this:

```
COPY A:\*.* NUL /B
```

or one such as the following if you are checking a disk or subdirectory

other than the one currently logged:

```
COPY C:\WP\LETTERS\ *.* NUL /B
```

In the command above, the destination is given as DOS's NUL device, which means there is no destination. DOS reads the files one by one and displays each name. If it cannot read a file, it notifies you. When using NUL with a COPY command, it's important to use /B to specify a binary read of each file. Without it, DOS assumes each file is ASCII and might quit before reaching the true end of the file.

COPY and Verify

Another of COPY's strengths is its ability to verify data as it copies. When I copy files from a hard disk onto a formatted floppy disk, I use a command such as the following:

```
COPY SCDATA\*.* A:/V
```

/V tells DOS to verify the data being copied. After DOS writes each block of data to the destination disk, it reads it back to verify the write. (However, COPY doesn't compare the written data with the original.) This version of the COPY command is slower, but it finds most errors as they happen.

Unfortunately, using the /v switch as a verifier is not a complete guarantee. If the disk drive is out of alignment, COPY may be able to read its own writing, but other drives may not. This is where the NUL destination technique pays off. Occasionally, I put into drive B a disk created on drive A and check it out using this command:

```
COPY B:*. * NUL /B
```

I always do this with program and data disks that I intend to send through the mail. If there's a problem reading the disk, I want to know immediately—not after it's too late to do anything about the problem.

Before you go on, a final note: If you divide a disk into subdirecto-

ries, you must check the files in each directory with a separate COPY command. (Although XCOPY automatically processes subdirectories, it refuses to copy files to the NUL device.)

Fixing Files with COPY

If part of a file is unreadable—if, for instance, a file called CHAPTER1.DOC is bad, and your word processor won't load it—you may be out of luck if you don't have a backup. When reconstructing a page or two is preferable to losing an entire manuscript, a command such as the following helps with word processing files:

```
COPY CHAPTER1.DOC A:CHAPTER1.NEW
```

DOS displays the message "Abort, retry, fail?" Press the R key. If that doesn't work after a few attempts, press F. Each time the "Abort, retry, fail?" message is displayed, press F again. The resulting file, CHAPTER1.NEW, contains the data, if any, that DOS can read. Start your word processor, load CHAPTER1.NEW, and fill in the missing text.

In principle, this technique does the same thing as the DOS RECOVER command, but it has several advantages. First, COPY is available in all DOS versions; RECOVER, on the other hand, isn't included in DOS 6's standard repertoire of commands. Furthermore, COPY never alters the original data on the hard disk. This lets you retry the command as many times as you want.

Copying Floppy Disks

DOS's DISKCOPY command duplicates an entire floppy disk. But what if it indicates that an error exists on your source disk? What if you want the format of the destination disk to be different from the original's—to create a 1.2MB disk instead of a 360K disk, for instance? COPY to the rescue!

First, format a disk for your destination drive, and then copy everything (*.*) from source drive A to destination drive B:

COPY A:*. * B:

If your source disk has subdirectories, use MKDIR (or MD) to re-create them on the destination disk. Then,

you can copy each subdirectory individually. (XCOPY, by the way, is better at this task, and can copy all files and subdirectories on a disk in one step.)

TIP MELTING POT

If you use numerous small batch files in your daily work, you may be wasting disk space because you're duplicating common DOS commands such as @ECHO OFF and CLS, and because DOS sets aside more space than the batch file actually needs. GO.BAT puts all your batch files under one roof.

As written, the program handles start-up procedures for three applications, Procomm, WordPerfect, and QBasic. To select the appropriate application, you invoke GO.BAT, supplying a command-line parameter that matches the label for the program you want to start. Typing this command, for instance, starts Procomm:

GO PRO

To modify GO.BAT for your purposes, create a start-up routine for each application, then preface each routine with a label. Finally, modify the ECHO statements near the end of the program to reflect the changes you've made.

GO.BAT helps you save disk space by letting you put all your batch files "under one roof."

```
ECHO OFF
CLS
IF %1==/ GOTO HELP
GOTO %1
:PRO
SET PROCOMM=C:\COM\PRO
CD\HOST
ECHO - Executing Procomm -
PROCOMM
SET PROCOMM=
GOTO END
:WP
CD\WP
ECHO - Executing WordPerfect -
WP
GOTO END
:BAS
CD\PROGRAMS
ECHO - Loading QBasic -
QBASIC
GOTO END
:HELP
ECHO.
ECHO When you invoke GO, you must include a label code.
ECHO.
ECHO The following label codes are available:
ECHO.
ECHO PRO starts Procomm
ECHO WP starts WordPerfect
ECHO BAS starts QBasic
PAUSE
:END
CLS
CD C:\
```

Duplicating a floppy disk using COPY instead of DISKCOPY has significant advantages. Sometimes a source disk contains an error that DISKCOPY senses but that COPY does not, because the error is on an unused part of the disk. Your data might be fine. At the very least, COPY will tell you which files are damaged.

This method also arranges the destination disk's files so that DOS can access them more efficiently. As COPY reproduces each file, it collects data that might be scattered over the source disk and writes it in a continuous block on the destination disk. In contrast, DISKCOPY makes a mirror image of the source disk, fragmented files and all.

A final advantage is that COPY is an internal command and always is in memory. Therefore, you don't need to find the disk that contains DISKCOPY.COM.

Viewing a File with COPY

Sooner or later, it happens to everybody. You come across a file or program on a disk, and you have no idea what it's for. The COPY command sometimes can help. Use the DIR command to find COMMAND.COM. It's usually in the root directory of your boot disk. Then type this command:

COPY COMMAND.COM CON

Some meaningless letters, numbers, and graphics characters scroll up your screen. The computer displays "1 file(s) copied," and the DOS system prompt returns. Try it again this way:

COPY COMMAND.COM CON /B

This time, the display, while still meaningless, is longer. Press Ctrl-S or the Pause key when you want to pause; press any key to resume scrolling through the display. Some familiar phrases whiz past: "Write protect," "Bad command or filename," "Unable to create directory," and so forth. You also see the copy-

right information that DOS displays on start-up. These messages are in the file because `COMMAND.COM` displays them. Using the same procedure with an unknown data file can help reveal its contents and purpose.

`CON` is the destination in this `COPY` command. Instead of creating a new file, DOS sends the data to the console—the video display. In this case, the strange characters are DOS's attempt to display program instructions as text. If you attempt to display a program file, you'll get similarly unreadable results.

Each byte in a program file holds a number from zero to 255, which the computer normally understands as part of an instruction to do something. `COPY` interprets the number in each byte as a symbol that it should display, with one major exception: Bytes having a value of seven cause the speaker to beep—you'll hear a lot of those.

The `/B` switch makes a big difference in the amount of information that is displayed. Without the `/B` switch, the first byte with a value of 26 is interpreted as an end-of-file marker. With it, the entire file (according to the size listed in the directory) is copied.

You can display ASCII files quite neatly with the `COPY` command. In an ASCII file, each byte is intended to correspond to a displayable character or a standard function, such as line feed, carriage return, tab, new page, or end of file. Files having the extension `BAT` or `TXT` are good examples.

Copying to the console is similar to using `TYPE`, but it gives you more flexibility. The `TYPE` command doesn't have a `/B` option and does not accept wildcard characters for viewing multiple files with one command. The only disadvantage of `COPY` is that you cannot press Break or Ctrl-C to abort the request. You've got to wait until it's done.

Creating a File with COPY

`COPY` also provides a quick and easy

way to create short text files. Type the following, pressing Enter after each line:

```
COPY CON TUESDAY.REM
Get haircut
Pick up Johnny after school
Call Mom
```

Then press F6 or Ctrl-Z, followed by the Enter key, and you'll have a file of reminders for Tuesday, called `TUESDAY.REM`. To display this file, type:

```
TYPE TUESDAY.REM
```

When you specify `CON` as the source for `COPY`, DOS uses the input as part of the console—the keyboard.

To add another reminder for Tuesday, type this command:

```
COPY TUESDAY.REM + CON
```

Now type the new reminder:

```
Water the flowers
```

and press Enter, then F6 or Ctrl-Z, and Enter again.

Use `TYPE` again, and you'll see that the system added the new line. (When used in this way, `COPY` assumes that the file or the device that appears after the plus sign is being appended to the file or device before the plus sign.)

Copying to the Printer

You can copy to a printer any file that you can display. Instead of `CON`, use `PRN` as the destination:

```
COPY TUESDAY.REM PRN
```

Make sure that a file is readable on the screen before sending it to the printer. Strange characters on your display might be codes that will make your printer go berserk. This kind of `COPY` command is good, for instance, for getting a printout of the `READ.ME` files that you sometimes find on program disks that you purchase.

COPY as a Typewriter

Here's an easy way to use your computer as a typewriter when you don't have a word processing program handy. You simply type this line:

```
COPY CON PRN
```

Then, turn on your printer and type your document, pressing Enter after each line. When you have finished, press F6 or Ctrl-Z followed by Enter, and you've got it on paper. (Some printers will react to each character; others will not print anything until you type an entire line, page, or file.)

Changing a File's Date

Another use for `COPY` is changing a file's date and time to correspond to your computer's current date and time. Suppose you want to change the date and time on a file named `SHOPLIST.TXT`. First, set the date and time to what you want the system to show in the directory listing for the file. Press the Enter key after each of the entries:

```
DATE 6-15-93
TIME 10:00
```

Next, make a copy of the file:

```
COPY SHOPLIST.TXT SHOPLIST.NEW
```

The copy now has the updated date and time. Then delete the original file and rename the copy:

```
DEL SHOPLIST.TXT
REN SHOPLIST.NEW SHOPLIST.TXT
```

Finally, re-enter the date and time to make them current.

Other COPY Commands

These are the most useful `COPY` command applications. Other options are available for combining files and copying to and from the serial ports. As you can see, it pays to explore the not-so-obvious uses of an everyday command such as `COPY`. ■

XCOPY Express

Almost everything COPY can do, XCOPY can do better.

by Hardin Brothers

The DOS COPY command is a relic of the mid-1970s. For today's computing needs, its power sometimes is limited and disappointing. For example, COPY ignores date stamps, update flags, and most of the computer's memory. It can't copy or create subdirectories, and you can't use it to maintain file archives.

XCOPY, one of the utilities added with DOS 3.2, does almost everything COPY can do, and it does it better, faster, and with less fuss. XCOPY even outperforms most commercial utility packages for some day-to-day tasks. Here are some hints to help you start experimenting with it right away.

Learning to XCOPY

XCOPY has most of the capabilities of COPY and a similar syntax. The easiest way to learn how to use XCOPY is to start including an X wherever you normally would type COPY. (See the table "Functions of XCOPY Switches" for an overview of the command's capabilities.)

If you are copying a single, small file, XCOPY won't save you any time. But if you use a wildcard command (one containing the character * or ?) to copy more than one file, or if the file you are copying is longer than 65,536 bytes (64K), you'll notice an immediate reduction in the time that the operation takes.

XCOPY is designed to use all of the computer's avail-

able memory. If you are copying 10 files that will fit in free memory, XCOPY is smart enough to read the files all at one time, then write them to the destination disk. This method is far more efficient and faster than the multiple read/write cycles through which the COPY command goes.

For example, I have 85 files in the \BIN directory on my hard disk; together, they occupy more than 64K of disk space. All of these files just fit on a 1.2MB floppy disk. If I copy those files to drive A with the following command:

```
COPY C:\BIN\*. * A:
```

the computer goes through more than 100 cycles of "Read from drive C" and "Write to drive A." The process takes nearly five minutes. But if I use the command:

```
XCOPY C:\BIN\*. * A:
```

the computer accesses the hard drive only four times. Each time, the computer reads as many files into memory as it can, then writes each one to drive A. The process takes two minutes and 48 seconds on my computer, about half the time required by the COPY command.

The time advantage is even more noticeable in floppy-to-floppy file transfers. Further, if you have a single floppy drive but more free memory than the total size of the files you need to copy, XCOPY lets you transfer files from one disk to another in one disk swap.

Setting Switches

Increased speed is nice, but XCOPY is more than a faster version of COPY. By manipulating its switches, you can make it perform many tasks that are cumbersome or impossible under older versions of DOS.

One of the most common uses of the BACKUP and MSBACKUP commands (and the popular utilities that replace them) is creating archives of data files at the end of the day. As long as no file exceeds the capacity of your floppy drive, XCOPY often outperforms DOS's backup programs at this task.

When DOS updates or creates a file, it sets a directory flag (called the archive bit) to show that the file was changed. If you use XCOPY with the /A switch, it copies only files whose archive bit is set. This command, for example, tells XCOPY to copy to drive A all modified files in the \ACCOUNTS subdirectory:

```
XCOPY C:\ACCOUNTS\*.* A: /A
```

A similar but more useful switch is /M, which tells XCOPY to copy only modified files; it works just as the /A switch does. The /M switch, however, goes one step further and turns off the archive bit. As a file is copied to your archive, it is marked as "unmodified" in the original directory. You can use this feature to automate the daily archiving process.

Perhaps you want to copy files that were created or modified after a certain date. The /D switch tells XCOPY to look at the date of each file and select only those files that were created or modified on or after the date you supplied. For example, I might use the following command to copy a set of project files to a single floppy disk:

```
XCOPY D:\WP\*.* A: /D:06-21-93
```

Only the files that were updated on or after June 21, 1993, are copied. (If you set the DOS country flag to display the date in a different format, use that format after the /D switch.)

XCOPY also understands subdirectories. If you add a /S

switch to the command line, XCOPY copies from the source directory and any subdirectories under it all files that match the source-file specification. It also creates appropriately named subdirectories on the destination disk if they do not exist already.

For example, I have a text editor that I regularly use for programming projects. When a new version arrived, I wanted to keep the old version on my hard drive while I installed and tested the newer version. The editor normally resides on drive C and has several of its own subdirectories: one for help files, another for macro commands, and so on. The command:

```
XCOPY C:\EDITOR\*.* D:\EDITOR\ /S
```

copied everything in \EDITOR from one disk to another, then everything in the \EDITOR\HELP subdirectory, the \EDITOR\MACROS subdirectory, and so on. It created those subdirectories on drive D while it was copying files. When XCOPY was finished, both disks contained exact duplicates of the \EDITOR section of my subdirectory tree.

The /S switch does not create a new subdirectory on the destination disk if the source subdirectory is empty. If you add the /E switch after it, however, /S creates all the appropriate subdirectories on the destination drive, even if some of those subdirectories are empty.

The /W and /P switches cause XCOPY to prompt the user. /W waits for a keystroke before copying any files. This is useful on floppy systems or in batch files when you want to give the user an opportunity to put a new disk in a drive. /P checks with you before copying each file to the target directory. You must type Y to copy each file or N to continue to the next file. XCOPY also returns a consistent set of completion codes that you can use with the ERRORLEVEL statement in a batch file to further automate archiving.

Changing XCOPY to MCOPY

A command such as the following is ambiguous:

```
XCOPY C:*.DAT D:\SAVE
```


If XCOPY finds that D:\SAVE doesn't exist, how can it tell whether that name refers to a file or a directory? XCOPY can't tell, so it asks you to type F or D to let it know.

DOS 3.3 users can avoid this situation by changing XCOPY's name to MCOPY. (This technique doesn't work with the XCOPY command available under PC-DOS or with MS-DOS 4.01 and later.) You can accomplish this in two ways: By modifying the existing XCOPY.EXE file with the RE-NAME command, or you can copy it to a file that has the new name by using the COPY or XCOPY command.

If you invoke the program with the MCOPY name, it makes certain assumptions about what you are trying to do, without stopping to ask

you. All of the assumptions make sense and probably will meet your expectations almost every time you use MCOPY. When it is called MCOPY, the program assumes that the target is a directory in three cases: when the source is a directory; when the source includes multiple files; and when a backslash is added to the end of the target name.

Because it's hard to imagine a situation in which these rules wouldn't apply, you may want to rename the program MCOPY once and for all if you use DOS 3.3. That way, DOS won't stop to ask whether it is copying to a file or a directory.

Sins of Omission

Compared with COPY and BACKUP,

XCOPY is great, but it suffers from a few omissions. For example, what if you need to copy files that were created before a specific date or between two dates? It also doesn't include a switch to erase the source files after they are copied, although this was resolved partially by the inclusion of a MOVE command in DOS 6. This shortcoming is annoying particularly because I enjoyed most of these capabilities as part of the LDOS and TRS-DOS operating systems on my Radio Shack TRS-80 Model 4 many a long year ago.

XCOPY has other limitations, as well. First, as an external command, XCOPY is not part of DOS's COMMAND.COM program. If you have a hard disk and a \DOS or \BIN subdirectory, and you have included that subdirectory in the search path, you have no reason to worry about which commands are internal or external.

But if you have a floppy-based system and normally replace your DOS disk with an application disk after booting up, you might have to swap disks to use external commands. The COPY command is internal to COMMAND.COM, which means it is available whenever you see the A:\> or C:\> prompt.

Second, XCOPY doesn't get along with logical devices. You can't, for example, use it to copy files to your printer or to input data from the keyboard to a text file. It operates only on files that are stored on disk.

Third, XCOPY can't append one file to another, nor can it correctly handle the difference between text and binary files created with DOS 1.x.; COPY can do both. On the other hand, how many data files and programs that were created with DOS 1.x do you have sitting around?

Nothing is perfect, not even XCOPY. Some things it simply can't do, and these gaps in its capabilities are good reasons for not abandoning COPY altogether. Nevertheless, XCOPY is a huge step forward because it provides some of the utility that Microsoft should have included in DOS from the beginning. ■

FUNCTIONS OF XCOPY SWITCHES

Switch	Function
/A	Copies only those files whose archive bit is set. (The A is for "archive.")
/M	Copies only those files whose archive bit is set and resets (turns off) the archive bit. (The M is for "modified.")

SUBDIRECTORIES

Switch	Function
/S	Copies specified files in a subdirectory as well as similar files in any subordinate subdirectories. Creates identical subdirectories on the target disk if they don't exist already. (The S is for "subdirectory.")
/E	Creates subdirectories on the target disk even if there are no files to put in them. You can't use /E without /S; /E must follow /S. (The E is for "empty.")

FILE DATES

Switch	Function
/D:mm-dd-yy	Copies files that were updated on or after the specified date. (The D is for "date.")

PROMPTS

Switch	Function
/W	Waits for the user to press a key to initiate copying. Ctrl-C aborts copying. (The W is for "wait.")
/P	Prompts the user for the go-ahead before creating each new file in the target directory. (The P is for "prompt.")

VERIFICATION

Switch	Function
/V	Checks each file after copying to verify that it is readable. The data in the source and destination files are not compared. (The V is for "verify.")

ANSI.SYS: A DOS Treasure

Explore this trove of useful DOS functions and gain greater control over your keyboard and display.

by Hardin Brothers

If you're willing to do some digging—and some experimenting—you can find a hidden treasure in DOS. It's a little gem called ANSI.SYS. Although most DOS manuals make it seem more mysterious than useful, ANSI.SYS can do big things for you. This one small file gives you greater control over your system's display and lets you create simple keyboard macros by redefining your function keys. It also lets you write more professional-looking batch files.

ANSI.SYS has 15 separate functions, which may be lumped into the following five categories: cursor control, screen erasure, video mode setting, video attribute setting, and key redefinition. To help you discover the capabilities of ANSI.SYS, I've created a 23-byte program called ESC.COM, which allows you to experiment with ANSI.SYS from the DOS prompt. (You create ESC.COM using my batch file MAKEESC.BAT.) Later, I also explain how to add the capabilities of ANSI.SYS to your batch files and programs.

The Basics of ANSI.SYS

Technically speaking, ANSI.SYS is a console device driver—a program that oversees the actions of the keyboard and screen, known collectively as the console. Introduced with MS-DOS 2.0, ANSI.SYS can replace the

console code in the DOS driver (CON) that DOS normally loads when you turn on your computer. It functions by intercepting special codes sent to the video display and using them to change the way the display and keyboard work.

The program owes its name to the American National Standards Institute (ANSI), which, along with the International Standards Organization (ISO), originally established an extensive set of console-control codes for terminals connected to mainframe computers. ANSI.SYS recognizes a subset of the control codes specified in ANSI's original X3.64-1979 console standard.

To begin experimenting with ANSI.SYS, you first must install it. Make sure that it's on your boot disk; then, using an editor or word processor that saves files in ASCII format, add the following line to your CONFIG.SYS file:

```
DEVICE=ANSI.SYS
```

If you keep ANSI.SYS in a subdirectory—a DOS subdirectory on drive C, for example—use this command instead:

```
DEVICE=C:\DOS\ANSI.SYS
```

Make sure that you don't place spaces on either side of the equal sign.

When you have the correct command in your CONFIG.SYS file, reboot your computer to install ANSI.SYS. It

will remain installed until you remove the device line from your CONFIG.SYS file and reboot.

ANSI.SYS Command Syntax

All ANSI commands have the same format. A command is introduced with an escape character and a left bracket. Reference manuals often use the abbreviation ESC to designate the escape sequence. However, on the screen, the escape character shows up as a left arrow (<-) or as a caret followed by a left bracket (^[). In either instance, the escape character stands for ASCII character code 27, not the Esc key on your keyboard.

These two characters—the escape character and a left bracket—usual-

ly are followed by a parameter, although some escape sequences don't require a parameter and others allow more than one. If you type two or more parameters, you must separate them with semicolons. The last character in a command is a function code. A typical ANSI code looks like this on screen:

<- [2J

The escape character and left bracket introduce the command; the 2 is a parameter that defines the entire display; the J is a function-code that tells ANSI.SYS to erase all or part of the display. (Be careful: the function code letter is case-sensitive; if you use a lowercase "j," the

command won't work.)

Before you begin to experiment with ANSI.SYS, you must find a way to send an ANSI command to the screen. You can't type simply an escape character at the DOS prompt; if you press the Esc key, DOS interprets that character as a message to erase the line and start over. Several alternatives do exist, however:

- You may create a text file with an editor that allows embedded control codes. Some editors let you enter the escape character by pressing Ctrl-[(it may appear as <- or ^[). You then can use DOS's TYPE command to display the file and activate the ANSI.SYS functions. (If you use DOS 5 and later, you may use DOS's screen editor, EDIT, to create the escape character. Simply press Ctrl-P and then press the Esc key.)
- You may create a batch file with an editor that lets you press Ctrl-[for the escape character and use the ECHO command in the batch file to activate ANSI.SYS functions.
- You may use the DOS PROMPT command, which interprets the code \$E as an escape code and sends it to ANSI.SYS.

All these methods are tedious when you simply want to explore ANSI.SYS's capabilities. With ESC.COM, you can experiment at the DOS prompt. MAKEESC.BAT contains the instructions for creating ESC.COM. From here on, I'll assume that you have it available.

Please note: When you are using ESC.COM, you must remember to leave a space between ESC and the left bracket because you're typing the program's name. A space always is required after a program name. Normally, commands you send to ANSI.SYS don't contain spaces. ESC.COM adds the necessary escape code to the codes you give it and sends the combined sequence to ANSI.SYS.

MAKEESC.BAT is a batch file that creates ESC.COM, a program that lets you experiment with ANSI.SYS.

```
: Copy this file with a text editor and save it as MAKEESC.BAT.
: Be sure that the DOS program DEBUG.COM is in the current
  directory
: or available through the DOS PATH. From the DOS prompt, type
: MAKEESC
```

```
: and you will have a copy of ESC.COM on your disk.
```

```
ECHO OFF
```

```
ECHO Creating ESC.COM in the current directory
```

```
DEBUG ESC.COM <MAKEESC.BAT >NUL
```

```
GOTO TEST
```

```
A100
```

```
MOV SI,80
```

```
MOV CH,0
```

```
MOV CL,[SI]
```

```
MOV BYTE PTR[SI+1],1B
```

```
MOV DX,81
```

```
MOV BX,1
```

```
MOV AH,40
```

```
INT 21
```

```
INT 20
```

```
RCX
```

```
17
```

```
W
```

```
Q
```

```
:TEST
```

```
IF EXIST ESC.COM GOTO OK
```

```
ECHO ESC.COM was not created!
```

```
ECHO DEBUG.COM must be listed either in the default directory
```

```
ECHO or in your DOS PATH setting
```

```
GOTO END
```

```
:OK
```

```
ECHO ESC.COM has been created
```

```
:END
```

End

After installing ANSI.SYS and creating ESC.COM, you can test it by typing:

```
ESC [2J
```

If the screen clears, you can begin to experiment—by category—with each of the capabilities of ANSI.SYS.

Cursor Control

With ANSI.SYS, you can control the cursor's location on the screen. Applications for using cursor control from the DOS prompt are limited, but you can incorporate these kinds of commands into a batch file. For example, you could use them to clear the screen and then dress it up by beginning the text at a particular location.

The simplest cursor control functions—A, B, C, and D—move the cursor up, down, right, and left (see the table “ANSI.SYS Functions”). Used without a parameter, each moves the cursor one row or column, but you also may specify how far you want the cursor to go. For example, you can press the Enter key until the DOS prompt is near the bottom of the screen and then type:

```
ESC [10A - Here I am -
```

and next press Enter again to see the cursor move 10 rows up the screen.

You may set the cursor to a specific position with the H and f functions, which operate identically on a PC screen. Both require two parameters. The first indicates the row, and the second indicates the column. To test these functions, type:

```
CLS
ESC [10;40H - Here I am -
```

or this alternative:

```
CLS
ESC [10;40f - Here I am -
```

You also can tell ANSI.SYS to remember the cursor position and reset it later, after some text is printed,

by using the s and u functions. Type the following lines to experiment:

```
CLS
ESC [s
```

Press Enter five times, and type:

```
ESC [u - Here I am -
```

ANSI.SYS remembers only one cursor location and moves the cursor there every time it receives the command ESC [u until you issue ESC [s again.

Finally, you may ask for the current cursor position, a facility that is more useful from inside a program than at the DOS prompt. But you can see the reply that ANSI.SYS gives by typing:

```
ESC [6n
```

The first character of the report, which appears on your screen as a backslash and line feed, is really the escape character.

Erasing the Screen

ANSI.SYS's screen-clearing function is useful if you want to clear only a portion of the screen. For example, you could move the cursor to the start of line 10 and clear the screen from there down.

All versions of ANSI.SYS support two erase functions. The command that I showed you earlier:

```
ESC [2J
```

clears the complete screen, much as the DOS CLS command does. In fact, DOS uses this command to clear the screen when you have ANSI.SYS loaded. Also, all versions of ANSI.SYS erase from the cursor to the end of the line when they receive this command:

```
ESC [K
```

Many, but not all, versions of ANSI.SYS recognize other forms of the J and K functions. You'll have to experiment to determine whether

your version supports the additional parameters shown in “ANSI.SYS Functions”: erasing from the top of the screen to the cursor, erasing from the cursor to the bottom of the screen, erasing a full line, and erasing the portion of a line that precedes the cursor.

Setting Screen Modes

You may set video modes with the DOS MODE command. For instance, you may switch from an 80-column text screen to a 40-column text screen that displays text in larger type, and you may turn screen color on and off. But ANSI.SYS's h function gives you more flexibility. You can use it to access all of the possible CGA text and graphics modes, including the ones that the MODE command ignores.

The syntax of the h function is a little unusual. Each of the mode numbers is preceded by an equal sign. The following command, for instance, puts the screen in a text mode that accommodates 40 characters by 25 lines:

```
ESC [=1h
```

To return the screen to its normal 80- by 25-character color text mode, type:

```
ESC [=3h
```

The other function that falls within the realm of screen modes is the 1 function, which takes the same parameters as the h function but uses 7 to turn character wrap off. When character wrap is turned on, any line typed at the DOS prompt that exceeds 80 characters “wraps around,” continuing onto the next line at the left side of the screen. With character wrap turned off, a line of more than 80 characters is truncated when it reaches the right side of the screen instead of being placed at the start of a new line. Thus, function 1 is handy if you want to use the DOS TYPE command to view a file without being distract-

ANSI.SYS FUNCTIONS

Cursor Control

Function	Syntax	Example	Default Value*
Move Cursor Up	xA	ESC[5A	x=1
Move Cursor Down	xB	ESC[5B	x=1
Move Cursor Right	xC	ESC[10C	x=1
Move Cursor Left	xD	ESC[10D	x=1
Position Cursor	r;cH	ESC[5;40H	r=1, c=1
Position Cursor	r;cf	ESC[5;40f	r=1, c=1
Save Cursor Position	s	ESC[s	
Restore Position	u	ESC[u	
Report Position	6n	ESC[6n	

Erasure

Function	Syntax	Example	Parameter	
			Value	Function
Erase Screen	xJ	ESC[2J	x=0	from cursor to end of screen**
			x=1	from top of screen to cursor
			x=2	entire screen
Erase Line	xK	ESC[OK	x=0	from cursor to end of line**
			x=1	from beginning of line to cursor
			x=2	all of line

Video Mode

Function	Syntax	Example	Parameter	
			Value	Function
Set Screen Mode	=xh	ESC[=3h	x=0	40 by 25 mono text
			x=1	40 by 25 color text
			x=2	80 by 25 mono text
			x=3	80 by 25 color text
			x=4	320 by 200 4-color graphics
			x=5	320 by 200 mono graphics
			x=6	640 by 200 2-color graphics
			x=13	320 by 200 16-color graphics (EGA, VGA)
			x=14	640 by 200 16-color graphics (EGA, VGA)
			x=15	640 by 350 black and white graphics (EGA, VGA)
			x=16	640 by 350 16-color graphics (EGA, VGA)
			x=17	640 by 480 2-color graphics (VGA)
			x=18	640 by 480 16-color graphics (VGA)
Set Character Wrap	=xh	ESC[=7h	x=7	turn character wrap on
	=xl	ESC[=7l†	x=7	turn character wrap off

* If parameter is not included. ** Default value of the parameter is zero. † Lowercase letter l, not the numeral 1.

ed by wrap-around lines.

You turn off character wrap with this command:

ESC [=7l

Note that the last character in the

command is the lowercase letter l, not the numeral 1. (Test the effect of this command by trying to type a line at the DOS prompt that is more than 80 characters long.)

To restore character wrap, type the command:

ESC [=7h

If you have a monochrome video card, only the character wrap commands have any effect. A standard monochrome card does not support any text modes other than one with

80 characters by 25 lines, and it has no graphics modes at all. Also, the so-called monochrome modes are different from corresponding color modes only on displays that have composite output.

Video Attributes

Most of the time, ANSI.SYS is used to set video attributes and colors from the DOS prompt and to liven up the dull, white-on-black DOS display. Colors and text attributes are set with the `m` function (see "Video Attribute Codes"). You may set attributes such as intensity or blinking characters, along with both the foreground and background colors, in a single ANSI.SYS command. For example, if you want your screen to display intense white characters on a blue background, type:

```
ESC [1;37;44m
CLS
```

Be sure to place semicolons between the numbers but not after the last number.

If you want to return the display to DOS's normal and boring white on black, you may do so quickly with this command:

```
ESC [0m
```

The zero tells ANSI.SYS to turn off

all video attributes, including colors, and return to normal.

Keyboard Codes

ANSI.SYS can redefine almost any key on your keyboard. You can use the `p` function to move punctuation marks to more convenient locations on your keyboard, have your function keys do something from the DOS prompt, or create a menu-based batch file.

For example, if you want to use the F10 key to call the current directory to the screen, type the following command:

```
ESC [0;68;"DIR";13p
```

The sequence `0;68` defines the F10 key, `DIR` is the text that ANSI.SYS substitutes for F10, and the value 13 represents the Enter key. Thus the entire command says, "Every time I press F10, type the `DIR` command and execute it for me."

You can redefine any key on your keyboard except the Shift, Ctrl, and Alt keys. The table "Key Redefinition" shows the values to use with the `p` command when you want to redefine a function key. To find the appropriate number to use for other keys, run `CODE.BAS`, a short program that runs in both GW-Basic and QBasic.

The `p` command often is used to create menus inside batch files. For example, you might program F1 to run 1-2-3, F2 to run DBase, and so on. Then you could print a menu on the screen so that a user could start the appropriate program simply by pressing a function key.

You may run into two problems with this function. First, ANSI.SYS has a limited amount of memory for storing key definitions. The amount varies with the version of ANSI.SYS and DOS you are using, but it allocates as few as 250 bytes of memory, which makes the program considerably less versatile than commercial keyboard macro packages. Second, you must ensure that you don't have one key definition call another. For example, if you set F10 to invoke `DIR`, then don't set F9 to write a string that invokes F10. ANSI.SYS can't call itself recursively; if you force it to try, you'll lock up your computer.

Beyond ESC.COM

ESC.COM can help you learn ANSI.SYS's command syntax and capabilities. Eventually, though, you'll want to put ANSI.SYS to work for you, and you'll find ESC.COM too limiting. ANSI.SYS codes generally are included in batch files (especially `AUTOEXEC.BAT`), in `PROMPT` statements, in text files that you expect

VIDEO ATTRIBUTE CODES

Attributes	Foreground Color	Background Color
0 = attributes off	30 = black	40 = black
1 = high intensity	31 = red	41 = red
2 = normal intensity	32 = green	42 = green
	33 = yellow	43 = yellow
4 = underline*	34 = blue	44 = blue
5 = blink	35 = magenta	45 = magenta
	36 = cyan	46 = cyan
7 = reverse video	37 = white	47 = white
8 = concealed**		

*monochrome only

**foreground set to background color

KEY REDEFINITION

Key	Used Alone	Used with Shift Key	Used with Ctrl Key	Used with Alt Key
F1	0;59	0;84	0;94	0;104
F2	0;60	0;85	0;95	0;105
F3	0;61	0;86	0;96	0;106
F4	0;62	0;87	0;97	0;107
F5	0;63	0;88	0;98	0;108
F6	0;64	0;89	0;99	0;109
F7	0;65	0;90	0;100	0;110
F8	0;66	0;91	0;101	0;111
F9	0;67	0;92	0;102	0;112
F10	0;68	0;93	0;103	0;113
F11	0;133	0;135	0;137	0;139
F12	0;134	0;136	0;138	0;140

CODE.BAS displays key codes for use with the ANSI.SYS key-redefinition function. You can run it from either GW-Basic or QBasic.

```
110 CLS
120 PRINT "Press keys to see their codes."
130 PRINT "Press ESC to stop."
140 WHILE A$ <> CHR$(27)
150   A$ = INKEY$
160   IF A$ = "" THEN GOTO 150
170   CLS
180   PRINT ASC(A$);
190   IF LEN(A$) = 2 THEN PRINT ";"; ASC(RIGHT$(A$,1))
200 WEND
```

End

to display with the DOS TYPE command, and in programs written in a variety of languages.

Let's assume, for example, that you want to set up your computer so that the DOS display always writes white letters on a blue background. Let's also assume that you want to use F7 to display a directory, F8 to change directories, and F9 to run DOS's CHKDSK program. You may do all of this by adding to your AUTOEXEC.BAT file four calls to ESC.COM. But it's more convenient to use a word processor that can embed control codes. Remember, the escape character will appear either as a small left-pointing arrow (<) or as ^[. If your word processor displays it as ^[, you'll need to add a second left bracket to invoke an ANSI.SYS function.

To accomplish all of this efficiently, add the following three lines to your AUTOEXEC.BAT file:

```
ECHO <- [37;44m<- [0;65;"DIR";13p
ECHO <- [0;66;"CD" p<-
[0;67;"CHKDSK";13p
CLS
```

Although this looks very confusing, it's fairly simple: The first portion of the first ECHO command, <- 37;44m, sets the screen color. The second section, <- [0;65;"DIR";13p, redefines the F7 key so that it executes the DIR command. The last two commands redefine the F8 and F9 keys. Finally, the CLS command makes the change of screen color visible.

After redefining a few function keys, you'll probably want a reminder of what each key represents. You can get that with the following DOS PROMPT command:

```
PROMPT $E[s$E[f$E[KF7=DIR F8=CD
F9=CHKDSK$E[u$E[K$P$G
```

Again, this looks much more confusing than it really is. In a PROMPT string, \$E represents the escape character; every \$E[is the beginning of an ANSI.SYS command. This line saves the cursor position (\$E[s), moves to the top of the screen (\$E[f) and erases that line (\$E[K), prints the key definitions (F7=DIR F8=CD F9=CHKDSK), returns to the former cursor position (\$E[u), clears that line (\$E[K again), and prints a prompt displaying the current path (\$P\$G). After you issue this command, it is invoked automatically every time you return to the DOS prompt.

Some Limitations

You can find commercial and shareware versions of ANSI.SYS that replace or extend its capabilities, but neither ANSI.SYS nor its replacements is a cure-all for dull screens. Programs of this sort have noticeable limitations. You may find that they conflict with some of the application programs you use.

Most commercial software accesses the keyboard and screen directly and is unaffected by ANSI.SYS. Some software restricts itself to DOS functions and always respects the

keyboard and screen settings you have made in ANSI.SYS. But a few programs mix direct and DOS screen writes. If you use such programs, you'll discover that some parts of your screen react to the ANSI.SYS settings while other parts ignore them.

If you use ANSI.SYS to change screen attributes and then find that your programs don't react properly, you have at least two choices: You may insert a batch file to turn off ANSI.SYS screen commands (ESC [0m), run your program, and then reset your favorite colors; or you may use a reconfiguration utility to enable ANSI.SYS only at certain times.

If you program in Basic, you'll find that you can't use ANSI codes inside normal PRINT commands. You must open an output file called CON and print to it. In addition, you'll need to open an input file named CON if you want your program to recognize ANSI key redefinitions. For example, you can print a warning in white letters on a red background using the following commands:

```
OPEN"CON"FOR OUTPUT AS 1
PRINT#1, CHR$(27);" [37;41m
WARNING!"
```

ANSI.SYS commands often are used by programmers who want their programs to run well on all computers, regardless of video display type, and by those who are writing bulletin board software and other communications-based programs.

ANSI.SYS enlarges MS-DOS by several thousand bytes, depending on the version. To conserve memory in DOS 5 and later, you may use the DEVICEHIGH command to load ANSI.SYS into upper memory. In earlier versions, you may have to remove ANSI.SYS when running programs that need the space.

In spite of these potential drawbacks, ANSI.SYS truly is a treasure. You will find that it makes your computer seem less stodgy and easier to use. ■

DOS Magic Tricks

It's no illusion. Mastering DOS's redirection symbols saves time and keystrokes.

by Chris DeVoney

You finally decide to unload your outdated disk files. You search your disk, and after peering at the outcome of the umpteenth `DIR` command, you decide a printed copy is in order. You could press `Ctrl-PrtSc` and reissue the `DIR`. Or you could try typing this command:

`DIR > PRN`

By tacking these few extra characters onto the back of almost any DOS command, you quickly and easily can send your output to a printer.

This sleight of hand, called I/O redirection, saves you time and keystrokes. It's one of many powerful capabilities available to DOS users. Since the introduction of DOS 2.0 and the adaptation for DOS of Unix's I/O redirection, piping, and filters, PC users have been able to command programs to get their input from any device or disk-based file and send the output of programs to a printer, modem, or disk file.

I/O redirection and piping have benefits and drawbacks. I'll show you how you can take advantage of these DOS functions and the programs (DOS-provided filters and others) that work well with them.

What Is I/O Redirection?

I/O redirection is easily understood by dissecting the

term. The *I* stands for *input*—the keystrokes you normally enter from the keyboard at a program's request. The *O* stands for *output*—the prompts and results of a program usually shown on the video display. Redirection is DOS's particular form of magic.

Instead of getting characters from the keyboard and showing them on a video display, DOS redirects programs to get their input from any device (including files stored on disk) and sends the results to another device. To DOS, all character-oriented devices—the keyboard, video display, modem, and printer—look like files on disk and may be interchanged freely. Meanwhile, your programs remain blissfully ignorant of the redirection and needn't be changed. You simply add a few keystrokes at the DOS command line before running a program or a command.

The Symbols and Syntax

Three symbols invoke I/O redirection. You can call them only at the DOS command line and only before you run a program; once a program is running, you cannot implement redirection.

These are the symbols and their meanings:

`<` informs DOS to get its input from the specified device or file (rather than from its standard input device, the keyboard).

`>` or `>>` informs DOS to send its output to the specified device or file (rather than to its standard output device, the video display). If a disk file is to receive the

output, the > symbol forces DOS to overwrite any previous version of the file before sending the output. The >> symbol causes DOS to preserve the file and add the output to the end of the file.

The syntax for I/O redirection is as follows:

symbol devicename

or:

symbol d:pathname\filename.ext

Use the first command format to redirect input from or output to a character-oriented device, such as a

printer. *devicename* is the legal DOS name of the device, such as LPT1 for the first parallel printer, COM1 for the first serial device, or PRN for the printer.

As I mentioned, the command sequence DIR > PRN informs DOS to start the DIR command and redirects DIR to send its output to PRN, the system printer (usually LPT1), instead of to the video display. To send the output to a printer connected to COM1, use the command sequence:

DIR > COM1

(If your serial printer needs to be

set up, complete the setup first.) You may put a space before and after any redirection symbol or omit either space. DOS also permits you to use the symbols < and > or >> on the same command line.

Try It Yourself

This simple example ought to give you a clearer understanding of how to implement I/O redirection. At the DOS prompt, type the following command sequence:

DIR > DIRS

DOS then establishes a file named DIRS in the current directory and places the output of the DIR command in the file.

After the DOS prompt returns, you can view the contents of the file by typing:

TYPE DIRS

You'll see the output of the DIR command on your screen. Now use the DIR command on a different directory—DIR C:\BIN, for example.

Take a moment to study the output. Then repeat the command, adding the >> symbol. The command sequence is:

DIR C:\BIN >> DIRS

Display the DIRS file using the TYPE command, as you did before. You'll see the original directory listing followed by the new listing. Now repeat the command you just gave, using the > symbol instead of the >> symbol. Display the file again. You should see only the second directory.

Keep in mind that when you use the > symbol with a file, DOS destroys the old file and creates a new one. When you use >> with a file, DOS normally appends the new output to the end of the file. It creates a new file only if the file for the redirection does not exist. Don't use > with a file you want to keep; DOS will wipe out the file. When in doubt, use >> instead of >.

TIP KEY STATES

If you have been frustrated by the status of your computer's Num Lock and Caps Lock keys at bootup, two simple Basic programs called GETKEY.BAS and SETKEYS.BAS can alleviate the problem. They let you set the start-up status of Num Lock, Caps Lock, and even Scroll Lock in one operation. GETKEY.BAS displays a number that represents the current status of your keyboard. SETKEYS.BAS uses that number to set your keyboard status.

After typing in GETKEYS.BAS, set the Caps Lock, Num Lock, and other keys the way you want them to be at bootup. Run GETKEY.BAS and write down the keyboard status number it displays. Then type in SETKEYS.BAS, substituting the status number for xxx in line 20.

On AT keyboards, the status indicator lights for the lock keys will change accordingly. The LEDs on XT keyboards, however, may be out of synch with the actual keyboard status.

To run SETKEYS.BAS automatically when you boot the computer, add a line such as the following to your AUTOEXEC.BAT file:

BASIC SETKEYS

If you use QBasic, use this line instead:

QBASIC /RUN SETKEYS

(Either provide a full pathname or keep SETKEYS.EXE in a directory listed in your PATH statement.)

If you have a Basic compiler, such as Microsoft's QuickBasic, delete line 30 and run the compiled SETKEYS.EXE file directly from AUTOEXEC.BAT. Again, SETKEYS.EXE must be available to DOS.

GETKEY.BAS displays a number that represents the current status of your keyboard.

```
10 DEF SEG=0
20 A=PEEK(&H0417)
30 PRINT A
```

SETKEYS.BAS runs from AUTOEXEC.BAT, setting your keyboard's status to conform with the value you substitute for xxx in line 20.

```
10 DEF SEG=0
20 POKE &H0417,xxx
30 SYSTEM
```


FIVE STANDARD DEVICES

DOS versions 2.x and later maintain five “standard” file-like devices that are opened and assigned a file handle at bootup. (Basic programmers can read from and write to these files without using the OPEN command.)

Of the five standard devices listed below, you can redirect only standard input and standard output. Although standard input, output, and error are the same device (CON), you can’t redirect standard error. Properly written programs send their error messages to standard error. Keep in mind that if your programs write to standard error, you’ll see the error messages even if output is redirected to a file. If the program doesn’t write to standard error, the error messages are redirected along with the other output.

STANDARD INPUT. The file/device from which programs usually get their input. The device normally is the keyboard. The DOS device name is CON (the console), and its file handle is zero.

STANDARD OUTPUT. The file/device to which programs normally send their output. The device usually is the video display. The DOS device name is CON (the console), and its file handle is 1.

STANDARD ERROR. The file/device to which error messages are sent. The device normally is the same as standard output (the video display), and its file handle is 2.

STANDARD AUXILIARY. The file/device to which communications are sent. The device normally is AUX (COM1), and its file handle is 3.

STANDARD LIST. The file/device to which listings (printed copy) are sent. The device normally is PRN or LST (LPT1 unless changed via the DOS MODE command), and its file handle is 4.

—C.D.

Real-Life Solutions

When testing their programs, programmers often use the < symbol to tell a program to get its responses from a file into which all the responses have been typed. This eliminates the need to retype the responses each time. You can use a similar form of this I/O redirection with the DATE or TIME command.

Many of us want to see the date and time at start-up, but we hate pressing Enter to answer the new date and new time questions. I/O redirection can eliminate this problem.

The first step is to build a file containing a single blank line. The simplest way to do this is to type the following command:

```
COPY CON BLANK
```

and press the Enter key. Press Enter again to insert the blank line (a carriage return) in the file, tap the F6 key, and press Enter once more. You’ll see a “1 file(s) copied” message.

Your disk now holds a file called BLANK. Next, type these commands:

```
DATE < BLANK
TIME < BLANK
```

The DATE and TIME commands still run, but you needn’t press Enter to answer the new date or new time question; the “canned” response you stored in BLANK inserts the press of the Enter key for you.

You can copy BLANK to your start-up directory and change the DATE and TIME lines in your AUTOEXEC.BAT file to DATE < BLANK and TIME < BLANK. DOS then displays the date and time and continues to the next line of your AUTOEXEC.BAT file.

If you redirect a program’s input, the file must hold all responses for the program. After input redirection begins, you can’t halt it. If the file doesn’t have all the answers, the results can range from problematic to disastrous. For example, the program might not continue without the additional answers (if the missing input affects the results of the program), or it might wait forever for the additional answers. (To “free” the computer, under DOS 2.x, you must restart DOS; under DOS 3.x and later, Ctrl-Break usually solves the problem, but it halts the program.)

Those who use batch files also can benefit from simple uses of I/O redirection. For example, batch-file users who want their screens to re-

main uncluttered while they are working can add this sequence to “silence” COPY or any other command:

```
COPY A:MYFILE B:YOURFILE > NUL
```

NUL is DOS’s dummy (null) device. Because this line sends COPY’s screen output to NUL, the “file(s) copied” message doesn’t appear on the screen, which keeps the screen clear for new input.

This exercise has a downside, however. Although the command sequence sends the output of COPY to NUL, it also redirects other output, including prompts about changing disks or similar messages. Be aware of this when redirecting the output of a program that requires some interaction, because you’ll never see any prompts; the program just mystically pauses. Error messages, however, go to the standard-error device, not the standard-output device, and therefore cannot be redirected. (See the sidebar “Five Standard Devices” for more information about standard error.)

More Words of Caution

Another surprise comes if you type

HOW DOS FILTERS WORK

DOS provides three programs that are useful with I/O redirection and piping. The programs are called filters because they act on, or filter, the input and output that pass through the program. The three filters are called **MORE**, **Sort**, and **FIND**.

MORE breaks up a long display of information into single pages. When you type **MORE**, DOS displays one screen of information, displays a “—MORE—” message, and waits for you to press a key. You typically use **MORE** with other programs in a pipe or as an alternative to the **TYPE** command.

Sort is used to sort information. In

this example, the **/+c/R** switch tells **Sort** to start sorting in column **c**:

```
Sort /+c/R
```

(**c** must be a positive integer). The **/R** switch tells **Sort** to sort in reverse order (**Z** comes before **A**, which comes before zero).

Sort typically is used with other programs in a pipe or is used with its input and output redirected. (Remember: Don't use the same file for the input and output of **Sort**. Unless the file is small, it is destroyed before the contents are sorted.)

FIND searches for a particular word or phrase within double quotes. Its **/N** switch tells **FIND** to display a line number before each line in the file. The **/c** switch tells **FIND** to count the lines, instead of displaying them. The **/v** switch tells **FIND** to display only lines that don't contain the specified string or strings.

FIND typically is used with other programs in a pipe or with its input redirected to the file that should be searched.

—C.D.

the wrong device name. Suppose you redirect input using **PRN** by typing:

```
PROG < PRN
```

Because the printer is an output-only device, your programs will wait forever for input.

Yet another problem results when you use the same filename for input and output redirection. For instance, DOS's **Sort** utility sorts information (see the sidebar “How DOS Filters Work”). Usually, **Sort**'s input and output are redirected to get the sorting done. Issuing this command, however, can be a mistake:

```
Sort < MYFILE > MYFILE
```

Unless **MYFILE** is very small, DOS destroys it (the **> MYFILE** portion of the command) before the file can be sorted. If **>>** is used, DOS adds the sorted information to the end of the file. **MYFILE** then contains the original information plus the sorted information. Usually, this is not the result you want. The solution is to use a temporary file, as in this command:

```
Sort < MYFILE > MYFILE1
```

After **Sort** is finished, you can delete the original file and rename the temporary file as the original file.

Remember that you can't use I/O redirection with all programs. For example, you can't redirect the output of programs such as Lotus 1-2-3 that write directly to the video screen. With programs that read the keyboard directly, you can't redirect the program's input. Fortunately, you can use I/O redirection with most programs.

Through the Pipe

If you can use I/O redirection with a program, you can use a pipe with it, as well. Piping is the running of two or more commands or programs where the output of one feeds directly to the next as the input.

The symbol for piping is a vertical bar (**|**), and its syntax is:

```
program1 | program2
```

where *program1* and *program2* are the names of the programs you want to run. DOS starts the first program in the pipe and shuffles its output into a temporary file. After the first program finishes, DOS starts the second one, sending the temporary file as input to the sec-

ond program. After the second program finishes, the temporary file is deleted.

In this command, for example, the output of **DIR** is sent to **Sort**:

```
DIR | Sort
```

This command alphabetically sorts output from **DIR**.

To sort the directory by file size, type:

```
DIR | Sort /+14
```

If the directory is long, you can get a paged list of the sorted directory by adding **MORE** to the pipe:

```
DIR | Sort | MORE
```

And, you can get a paged list of the directory sorted by file size with this command:

```
DIR | Sort /+14 | MORE
```

Unfortunately, however, the lines that provide information on the number of files or the displayed directory appear out of place. By adding the filter **FIND** to the pipe, you can remove the unwanted lines. This command, for instance, passes along to **Sort** only the lines in the

directory display that contain a minus sign:

```
DIR | FIND "-" | SORT | MORE
```

A minus sign is used only in lines that have a file date. By adding the FIND, you eliminate all unwanted lines.

By definition, programs used with a pipe have their input or output redirected automatically. In other words, you can't redirect the output of a program on the left side of the pipe symbol nor redirect the input of a program on the right side of a pipe. However, you can redirect the input for the left program or the output of the right program. For example, you can place the result of the stripped, sorted directory into a file by typing:

```
DIR | FIND "-" | SORT > SDIR
```

Instead of using |, the sequence > SDIR sends the output to a file called SDIR.

A potential source of confusion results from using a program that pauses for user input within a pipe. For example, using DIR /P when piping (or with redirected output) is a waste. The /P switch causes DIR to pause after displaying a screenful of information. However, the prompt to press a key is redirected, so you don't see the message. You must press a key after each invisible screenful of information is sent to the next program. When the piping finishes, the final output is produced by the other program. Unless that program pauses, the output comes flying onto the screen.

This caution also applies to MORE. There is little sense in temporarily halting output that becomes the redirected input of another program. The caution does not apply when MORE is the last program in a pipe, however.

One final caution involves adequate disk space. To handle piping, DOS uses a temporary file in the root directory of the current

disk. If you don't have adequate free disk space for the temporary file, DOS stops the piping. You must free up some disk space before trying the piping again. Generally 64K to 128K of free disk space is more than sufficient.

Let Yourself Go

I/O redirection and piping can assist you in making your computing time more efficient. By simply adding a few characters to the DOS

command line, you can switch the input and output of many programs. You can, for example, retrieve responses from a file and send the results to a printer, modem, or file. Additionally, DOS provides a few useful programs that can "condition" the output of files or programs. Although you cannot invoke I/O redirection and piping in all programs, its usefulness in your daily operations is limited only by your imagination. ■

TIP DIRECTORY ASSISTANT

GO.BAT changes directories for you. It is a clever replacement for DOS's CHDIR (CD) command. But it also runs a program when you specify the directory and program name as parameters in the command line. Typing the following, for instance, switches you to the subdirectory \PLAN and runs SHEET.EXE:

```
GO PLAN SHEET
```

GO.BAT is smart; if the program and subdirectory in which it resides have the same name, you need specify that name only once. For example, typing:

```
GO 123
```

switches you to your \123 directory and runs Lotus 1-2-3. If you want to switch to a subdirectory without running a program, add a period (.) as the last parameter.

Like CD, GO.BAT can use the double period symbol to move up one level in your subdirectory structure. Typing this command, for example, moves you up one level and down into the subdirectory \MARCH:

```
GO .. MARCH
```

Typing the program name without parameters gives you a quick trip back to the root directory.

GO.BAT lets you change directories without typing a backslash.

```
ECHO OFF
CD \
:LOOP
IF "%2"==" " GOTO DONE
CD %1
SHIFT
GOTO LOOP
:DONE
IF EXIST %1.COM GOTO RUN
IF EXIST %1.EXE GOTO RUN
IF EXIST %1.BAT GOTO RUN
CD %1
IF EXIST %1.COM GOTO RUN
IF EXIST %1.EXE GOTO RUN
IF EXIST %1.BAT GOTO RUN
SHIFT
:RUN
%1
```


Batch-File Basics

Learn how to create batch files and reduce the tedium of performing repetitive computing tasks.

by Jeff Holtzman

Just imagine how expensive cookies would be if they had to be baked one at a time; you probably wouldn't eat very many cookies. To make cookies affordable, bakers long ago learned to bake them in batches. Computers, too, can perform tasks in batches. By stringing together command sequences in a batch file, you can, for example, have your computer display the time and date, change your default drive, and automatically load your word processor—all with a single command.

Batch files, easy-to-create text files containing DOS commands, can save you time and frustration by automating the execution of virtually any number of frequently used command sequences. In this article, I show you how to create and use batch files. I provide sample batch files and several helpful utilities that increase the usefulness of batch-file processing. Familiarity with basic DOS commands, such as COPY, PATH, DIR, MKDIR (MD), CHDIR (CD), and RMDIR (RD), is all you need to begin.

To understand batch files, you must understand a little about how the software components of PCs work. Within the computer is an integrated circuit that contains instructions to get the machine up and running. When you turn on a PC, it goes through a Power-On Self-Test (POST), which actually is a series of tests. If the hardware passes these tests, the PC then attempts to load the most important ground-level routines, referred to collectively as DOS.

These low-level routines are contained in the first sectors of a bootable floppy disk or the first DOS sectors of a bootable hard disk. Eventually, the PC loads a DOS program called COMMAND.COM, which turns over control to your applications by collecting and interpreting your keystrokes. COMMAND.COM also executes your batch files.

What Is a Batch File?

A batch file is simply an ASCII text file that contains a list of one or more commands just like those you type at the keyboard. You run a batch file as you would a program, by typing its name and pressing the Enter key.

Suppose you have a hard drive with a fairly involved subdirectory structure that you regularly traverse by typing lines such as this at the DOS prompt:

```
CD\FINANCE\1993\JUNE\EXPENSES
```

You'll save yourself a lot of typing by creating a batch file containing only that line.

Batch-file names must include the BAT extension, but the preceding eight letters are up to you. For example, you might call your expense file E.BAT. Whenever you want to get into the \FINANCE\1993\JUNE\EXPENSES subdirectory, you only need type E and press Enter. That command gets you into the subdirectory; you can create other batch files to get out, go to other subdirectories, and so on. In fact, you can create a single batch file that lets you switch from one subdirectory to any other.

You can interrupt the execution of a batch file at any time by pressing Ctrl-C or Ctrl-Break. DOS gives you a chance to change your mind by asking, "Terminate

batch job (Y/N)?" Typing Y returns you to the DOS prompt; typing N instructs the computer to continue.

The Batch File's Batch File

The first time COMMAND.COM is loaded, it executes a special batch file called AUTOEXEC.BAT. You've probably seen AUTOEXEC.BAT on your boot disk or in the root directory of your hard disk.

AUTOEXEC.BAT lets you automate the process of setting up your daily computing environment. You might use it to set the time and date, to load memory-resident programs, to set up your printer, and so on. If you find yourself typing the same set of commands every time you turn on your computer, you can simplify the process by placing those commands in your AUTOEXEC.BAT file. Let's look at an example.

Sample 1 shows an AUTOEXEC.BAT file. The first three lines call DOS functions, not external programs. The first prevents output from the succeeding lines from cluttering up the screen. The second line forces DOS to verify data as it is written to disk. The third sets up the path DOS uses to find the programs you run. The fourth loads DOS's FASTOPEN utility, which speeds up directory accesses. The fifth line loads DOSKEY, the DOS command-line editor. Don't worry if you don't understand the function of every line; for now it's important only that you see the format of an AUTOEXEC.BAT file. I'll discuss the DOS functions listed in that file in greater detail later.

How to Create a Batch File

You can create a pure ASCII batch file in many ways. MS-DOS 1.25 through 4.x provide two methods of creating such a file: the COPY command and the EDLIN line editor. Beginning in version 5, you instead may use EDIT, DOS's full-screen editor. In addition, many commercial and public-domain text editors can create pure ASCII text files.

Most users think that the COPY command only transfers files among disks and subdirectories. COPY also can accept input from the keyboard and provide output to various devices, including the monitor and the printer. You can create a batch file with COPY by typing the COPY CON command (CON stands for *console*) followed by the

name of the file. For example, to create a batch file called TEST.BAT, you'd type:

```
COPY CON TEST.BAT
```

Then you would type in the desired commands one line at a time, using the Backspace key for editing. After typing in the last line, press the Enter key, followed by the F6 key (or Ctrl-Z), and then press Enter again. DOS then displays the message, "1 file(s) copied."

When you create a batch file with COPY, you can't edit a line after you press Enter. You can, however, use any ASCII-compatible editor to alter batch files created with COPY. COPY is part of DOS, it doesn't require you to locate an external program. As such, it's usually convenient to use COPY for creating short batch files.

You also can use EDLIN to create batch files. Its operation is covered in the DOS manual, so I won't discuss it here. EDLIN is better than COPY in that you can edit previously entered lines with it; however, it is not screen-oriented, and its command syntax is less than intuitive. EDLIN gets the job done, though, and is included with every copy of DOS except version 6. It's worth at least learning the basics, especially if you foresee being stuck without your favorite text editor. Beginning in DOS 5, you also may use EDIT. With its pull-down menus and on-line help, EDIT is the easiest DOS editor yet.

You can use your normal word processor to create batch files. The only requirement is that it save files in ASCII format. You also can use the editors in Turbo Pascal, DBase, and many other programs.

You now know how to create batch files; the next step is to put them to work. There are eight basic batch commands: FOR, GOTO, IF, PAUSE, ECHO, REM, SHIFT, and CALL. These commands are part of the DOS kernel; you can

Sample 1: AUTOEXEC.BAT

```
ECHO OFF
VERIFY ON
PATH C:\;C:\DOS;C:\UTILS;C:\OUTLINES;C:\PCTURBO
FASTOPEN C:
DOSKEY
```


combine them with external DOS programs, such as FIND.EXE, SORT.EXE, and MORE.COM, and with external non-DOS programs. I'll discuss various combinations of internal commands and external commands shortly.

The ECHO Command

ECHO probably is the most used (and the most cursed) DOS command. On the surface, it's simple—deceptively so. ECHO is used to turn off screen output from DOS and to display messages on the screen.

Boot your computer and at the DOS prompt type:

```
ECHO OFF
```

Then press Enter. What you see next is nothing; your normal prompt isn't displayed. Now type DIR and press Enter. Each letter you type should appear on screen. Press Enter again, and you should see a normal directory listing. To restore ECHO, type:

```
ECHO ON
```

and press Enter. Your prompt should return.

The point of this exercise is to show that DOS simply does not disable screen output when you turn off ECHO. Within a batch file, however, turning off ECHO eliminates most output from DOS. The main reason for turning off ECHO in a batch file is to avoid cluttering the screen with cryptic messages. In addition, if you're setting up a system that other people will use, you may not want to confuse them with messages they have no need to understand.

To see how ECHO functions in a batch file, create a file called TEST1.BAT. Although you can use whatever means you want, the following line will suffice:

```
COPY CON TEST1.BAT
```

Be sure to spell the extension correctly—DOS won't know it's a batch

Sample 2: TEST1.BAT

```
ECHO OFF
CLS
ECHO Hello!
ECHO:
ECHO Hello again!
```

file otherwise. The contents of the file should look like that in Sample 2. Be sure to type in the colon immediately after the word *echo* in the fourth line. If you use a version of DOS earlier than 3.0, type in two spaces rather than the colon in this example and the ones that follow. By the way, don't worry about capitalization; DOS is not picky about it, except in some uses of the IF statement. After typing in the program, execute it by typing TEST1 at the DOS prompt.

The first line turns off ECHO; the second line uses another internal DOS command to clear the screen. The third line makes the greeting "Hello!" appear on the top line of the screen. The next line displays a blank line, and the one after that displays "Hello again!"

For your last experiment with ECHO, delete the first line from your TEST1.BAT file so that the program no longer contains an ECHO OFF statement. Now run TEST1.BAT again. You'll notice that each line in the file appears on the screen beside your usual prompt, just as if you had typed it in yourself.

You can turn ECHO on and off as many times as you want in a batch file. If you turn off ECHO, you don't have to turn it back on at the end of the file; DOS does this for you automatically.

The REM Command

Much easier to understand than ECHO is REM, which is short for *remark*. Like its counterpart in the Basic programming language, REM lets you insert comments in a batch file; DOS ignores everything in a line that begins with a REM command. The command is useful for documenting how a batch file works, for testing, and for debug-

ging. For example, in the last example above, you eliminated the ECHO OFF statement at the beginning of the file. Instead, you could have inserted REM at the beginning of the line:

```
REM ECHO OFF
```

In versions of DOS prior to 3.0, you could use a period rather than REM (.ECHO OFF). That trick no longer works, however. In fact, the only shorthand symbol I've been able to find is the colon. It's used as a label for the GOTO statement.

To see how the REM statement works, create a new test file, TEST2.BAT, as shown in Sample 3. Type it in and run it by typing TEST2 at the DOS prompt. Now go back and take out the first line (ECHO OFF). The first time you run it, the remarks won't appear on your screen because ECHO is off. The remarks are displayed the second time because ECHO is on.

The PAUSE Command

The PAUSE command is used to halt batch-file processing temporarily. When DOS encounters a PAUSE command, it displays the message, "Strike a key when ready." DOS displays that message regardless of whether ECHO is on or off. PAUSE is useful when you want to display several lines of text, give the user a chance to read them, and then execute some other command or program. You can try it directly from the DOS prompt or from within one of your test files.

Sample 3: TEST2.BAT

```
ECHO OFF
REM This is the first REM.
CLS
REM This is the second REM.
ECHO Hello!
REM This is the third REM.
ECHO:
ECHO Hello again!
REM This is the fourth and
    last REM.
```


You also can use the PAUSE command whenever you want to stop execution of a batch file. If you press Ctrl-C when PAUSE displays the message, DOS asks, "Terminate batch job (Y/N)?" If you type a Y, DOS stops executing that batch file and returns you to the DOS prompt. Typing N tells DOS that it should continue processing the batch file. Any other response causes DOS to ask the question again.

Sometimes you want processing to halt temporarily, but you don't want the "Strike any key" message to be displayed—perhaps because you have a message of your own that's more appropriate. You can get rid of DOS's message by including the following line in your batch file:

```
PAUSE > NUL
```

The GOTO Command

The GOTO command lets you alter the normal linear sequence with which DOS processes batch files. GOTO is used with a descriptive label. When DOS encounters a line containing a GOTO label, it scans the batch file from the beginning and looks for a line containing a colon and the desired label. The colon needn't appear in column 1. Sample 4 shows a simple batch file that exemplifies the use of the GOTO statement.

Although the label may contain many characters, DOS pays attention only to the first eight. Capitalization of the label in the line containing the GOTO needn't match that in the line containing the label.

You may use GOTO by itself (as shown in Sample 4) or with the IF command.

The IF Command

The IF command is one of three commands that gives the DOS batch command processor some re-

Sample 4: TEST3.BAT

```
ECHO OFF
CLS
GOTO SKIPPED
ECHO This line shouldn't print.
ECHO Nor should this line.
:SKIPPED
ECHO This line should print.
ECHO And so should this one.
```

semblance to a real programming language. It lets you test for one of three conditions: the existence of a file, the equality of two strings, and the value of an internal DOS variable called ERRORLEVEL. In addition, by preceding the condition with the word *not*, you can test for the opposite condition. That gives a total of six possible forms of the IF command.

Sample 5 shows a program using the IF EXIST command to display the contents of your AUTOEXEC.BAT file on screen. Sample 6 shows a varia-

Sample 5: SHOWAUTO.BAT

```
ECHO OFF
CD\
IF EXIST AUTOEXEC.BAT GOTO DOTYPE
ECHO No AUTOEXEC.BAT exists
ECHO on this drive.
GOTO END
:DOTYPE
TYPE AUTOEXEC.BAT
:END
```

tion of the same program using IF NOT. Although the checking done by the program may seem excessive when its sole purpose is to display the contents of a file, the basic concept can be useful. If you were setting up a menu-driven system that would let an inexperienced user run various programs from a menu, you could use IF EXIST to replace a cryptic DOS error message with a friendlier one of your own creation.

Sample 7 depicts a more general routine. SHOWANY.BAT lets you view the contents of any file in any subdirectory, and unlike the unaided TYPE command, SHOWANY.BAT will pause after each screenful of information. You use it by typing in a line such as the following:

```
SHOWANY [d:][pathname]filename.ext
```

substituting the drive, pathname, and filename of the file you want to

Sample 6: SHOWNOT.BAT

```
ECHO OFF
CD\
IF NOT EXIST AUTOEXEC.BAT
  GOTO ERROR
TYPE AUTOEXEC.BAT
GOTO END
:ERROR
ECHO No AUTOEXEC.BAT exists
ECHO on this drive.
:END
```

view. It needn't reside in the current directory, although SHOWANY.BAT must, or it must be in a subdirectory listed in your AUTOEXEC.BAT's PATH statement. Note that the %1 in the second, third, fourth, and eleventh lines of Sample 7 is a replaceable parameter. DOS lets you pass as many as nine parameters to a batch file or even more by using a special command, which I'll explain later. To refer to a specific parameter, use a percent sign and the number corresponding to the desired parameter.

Errors may occur if the specified

Sample 7: SHOWANY.BAT

```
ECHO OFF
IF /%1==/ GOTO ERROR1
IF NOT EXIST %1 GOTO ERROR2
TYPE %1 | MORE
GOTO END
:ERROR1
ECHO You must enter a filename
ECHO (with optional drive and pathname)
GOTO END
:ERROR2
ECHO No %1 exists on this drive.
:END
```


SETERR.BAS creates a program that lets you set the **ERRORLEVEL** variable to any value from zero to 255.

```

10 REM SETERR.BAS
20 REM This program creates SETERR.COM, which sets the DOS
30 REM ERRORLEVEL to the value specified in the command line.
40 REM Values may range from zero to 255. Use it like this:
50 REM SETERR 100
60 REM -----
70 KEY OFF:CLS
80 OUTFILE$="SETERR.COM"
90 OPEN OUTFILE$ AS 1 LEN=1
100 FIELD 1,1 AS A$
110 READ COUNT,CHECKSUM
120 FOR I=1 TO COUNT
130   READ BYTE$
140   BYTE$="&h"+BYTE$
150   BYTE=VAL(BYTE$)
160   CHECK=CHECK+BYTE
170   LSET A$=CHR$(BYTE)
180   PUT 1
190 NEXT I
200 CLOSE
210 IF CHECK = CHECKSUM THEN 250
220 PRINT "Error in data statements--file not created."
230 PRINT "Please check data and try again."
240 KILL OUTFILE$
250 END
260 DATA 62,7430
270 DATA B0,00,BE,00,00,8A,9C,80
280 DATA 00,80,FB,02,7C,2C,46,FE
290 DATA CB,46,8A,94,80,00,80,FA
300 DATA 2F,7E,1D,80,FA,3A,7D,18
310 DATA B1,0A,F6,E1,80,EA,30,00
320 DATA D0,FE,CB,75,E4,50,8A,D0
330 DATA B4,02,CD,21,58,E9,02,00
340 DATA B0,00,B4,4C,CD,21

```

End

file doesn't exist or if no file is specified. It's easy to determine whether a file exists by using the **EXIST** clause of the **IF** command. But how can you tell if no parameters were entered? Use the second of the **IF** tests mentioned above: the equality of two strings. The second line of Sample 7 shows how to do it. You might think you simply could use this command by itself to test for a null string (that is, nothing entered):

```
IF %1==
```

but DOS won't let you do it. By putting slash marks on both sides of the equal signs, you can fool DOS. To see how it works, put a **REM** command in front of the **ECHO OFF** command in your **SHOWANY.BAT**

file. Then run the program several times, once with a nonexistent file and once with a file that does exist. You'll see that DOS expands the %1 variables to the actual strings they represent (if any). Incidentally, the slashes are arbitrary; you can use any symbols or letters except <, >, or |.

A DOS Pipe

Note the vertical bar (|) followed by the word **MORE** in the fourth line of Sample 7. **MORE.COM** is a DOS program that displays 24 lines on the screen and then pauses and waits for a keystroke. The vertical bar is the DOS symbol for a pipe.

As mentioned earlier, DOS maintains a system variable called **ERRORLEVEL**. The value of **ERRORLEVEL**

can be tested in a batch file and appropriate actions taken, based on its value. Several DOS programs use **ERRORLEVEL**: **FORMAT.COM**, **BACKUP.COM**, **RESTORE.COM**, **XCOPY.EXE**, **DISKCOPY.COM**, **DISKCOMP.COM**, and **REPLACE.EXE**. But numerous non-DOS programs, both commercial and those in the public domain, set **ERRORLEVEL** and thereby allow your batch files to make decisions based on that value.

To learn how **ERRORLEVEL** works, type in the Basic program called **SETERR.BAS**. It creates a short program called **SETERR.COM** that lets you set **ERRORLEVEL** to any value from zero to 255. It also displays the ASCII character corresponding to the value entered. You might use it in a line such as this one:

```
SETERR 100
```

Use only one space to separate the command from the value, and specify the value in decimal notation. If **SETERR** detects a nondecimal character in the specified value, it sets **ERRORLEVEL** to a value of 255, and no character is displayed.

You can experiment with setting **ERRORLEVEL** from the command line, but DOS makes no effort to preserve the **ERRORLEVEL** value when programs are run from the command line. So, when you are experimenting at the command line, it's best to test **ERRORLEVEL** immediately after a program is executed.

ERRORLEVEL works like this: The statement **IF ERRORLEVEL** is true if the value of **ERRORLEVEL** is greater than or equal to the value being tested. For example, use **SETERR** to set **ERRORLEVEL** to a value of 100. Then enter the following:

```
IF ERRORLEVEL 101 ECHO YES
```

You should not see the message **YES**. Now enter this command:

```
IF ERRORLEVEL 100 ECHO YES
```

You should see **YES** this time. Now reset **ERRORLEVEL** and try it again:


```
SETERR 100
IF ERRORLEVEL 99 ECHO YES
```

You should see YES this time, too. You also may test whether ERRORLEVEL is less than the specified value by using the NOT modifier in the following manner:

```
SETERR 100
IF NOT ERRORLEVEL 100 ECHO YES
```

A value of 101 should cause the message YES to be displayed; values of 100 and 99 should not.

You must be careful when using ERRORLEVEL to test for one of several conditions in a batch file, because any ERRORLEVEL greater than the specified value produces a true condition. One way around the problem is to use a nested IF clause. For example, the following line displays the message YES if and only if ERRORLEVEL has a value of 100:

```
IF ERRORLEVEL 100 IF NOT
ERRORLEVEL 101 ECHO YES
```

To verify this, run the test several times plugging in several different values for ERRORLEVEL: 99, 100, 101, and 102.

If you want to use a series of IF

statements to perform different actions depending on, for example, a user-input number from a menu, check for the higher numbers first, and you won't have to use nested IF statements. For example, suppose you've set up a menu system from which a user can choose an item numbered from 1 to 4. The ASCII value of the choice is returned as an ERRORLEVEL value. So pressing the 1 key returns 49, pressing 2 returns 50, and so on. To ensure that only valid entries are acted on, your batch files might look like this:

```
IF ERRORLEVEL 53 GOTO ERROR
IF ERRORLEVEL 52 GOTO CHOICE4
IF ERRORLEVEL 51 GOTO CHOICE3
IF ERRORLEVEL 50 GOTO CHOICE2
IF ERRORLEVEL 49 GOTO CHOICE1
:ERROR
```

The first line forces processing to continue at the label ERROR if a value greater than or equal to 53 is entered (this is the ASCII value of the 5 key). If a key with an ASCII value less than that for the 1 key is entered, error processing also occurs; after the last IF statement.

The FOR Command

Along with the IF command, the FOR command is what gives DOS real

Sample 8: MYTYPE.BAT

```
ECHO OFF
FOR %%A IN (%1) DO TYPE %%A
```

power and control. Like IF, FOR lets you vary the sequential way in which DOS normally processes files. It lets you execute a single command (or more than one using a trick I'll discuss later) on a group of files. For example, look at the batch file in Sample 8. It's called MYTYPE.BAT because it functions as a multiple TYPE command. Execute it by entering:

```
MYTYPE [d:][pathname]filename.ext
```

The drive and path specifications are optional, and the filename may include wildcards. You could use the program, for example, by typing the following command to look at all batch files in your current subdirectory:

```
MYTYPE *.BAT
```

Note the use of the percent sign (%) in Sample 8. The variable with the single percent sign refers to what will be the expanded command-line parameter; that is, the individual filenames. The variable with the double percent signs (%%A) is the "local" FOR variable; it is inaccessible to other commands in the batch file. The local variable may contain only a single letter.

FOR commands also may be typed at the DOS command line. However, the local variable must contain only a single percent sign. The following command is functionally equivalent to MYTYPE.BAT, except that because echoing is on, each command is expanded and displayed as if you had typed it at the keyboard:

```
FOR %A in (*.BAT) DO TYPE %A
```

If that doesn't make sense, just try it—it's easier to see than it is to explain.

Figure. Sample output from SHIFTEST.BAT.

```
C>shiftest.bat a b c d e f g h i j k l m n o p q r s
C>echo off
shiftest.bat a b c d e f g h i
a b c d e f g h i j
b c d e f g h i j k
c d e f g h i j k l
d e f g h i j k l m
e f g h i j k l m n
f g h i j k l m n o
g h i j k l m n o p
h i j k l m n o p q
i j k l m n o p q r
j k l m n o p q r s
k l m n o p q r s
l m n o p q r s
m n o p q r s
n o p q r s
o p q r s
p q r s
q r s
r s
s
```


The FOR command's file specification set may contain more than a single filename. You might, for instance, use it like this:

```
FOR %A IN (TEST1.BAT TEST2.BAT)
DO TYPE %A
```

In fact, there is no practical limit on the number of files that you may include in the FOR command's file set; ambiguous and unambiguous file specifications (those with and without wildcard characters, respectively) may be mixed, as in the following example:

```
FOR A% IN (*.BAT DATAFILE.TXT X.Y)
DO TYPE %A
```

The length of the command is restricted only by DOS's limit of 127 characters per input line.

The SHIFT Command

Remember I mentioned that DOS lets you pass as many as nine parameters to a batch file, and that a means exists for accessing even more. The SHIFT command is what makes this possible. It also has some other useful functions.

SHIFT works as follows.

Each time the command is invoked, each parameter is shifted down by one. So, if you started a batch file with 10 parameters like this:

```
SHIFT A B C D E F G H I J
```

variable %1 would contain *A*, variable %2 would contain *B*, and so on. If SHIFT were executed once from within the batch file, variable %1 would contain *B*, variable %2 would

Sample 9: SHIFTEST.BAT

```
ECHO OFF
:START
IF /%0==/ GOTO END
ECHO %0 %1 %2 %3 %4 %5 %6 %7 %8 %9
SHIFT
GOTO START
:END
```

contain *C*, and so on.

Actually, DOS provides a total of 10 variables, labeled %0 through %9. Before any SHIFT commands are executed, %0 would contain SHIFTEST. After shifting, it would contain *A*. You can see how SHIFT works by typing in the program SHIFTEST.BAT, shown in Sample 9. Sample output is shown in the figure, "Sample Output from SHIFTEST.BAT." Note that because the program is testing for the existence of variable %0 (in the third line), it executes the fourth line even if no parameters are specified on the command line. The loop continues until the last variable is shifted out of variable %0. In the figure, note that the name of the file appears only in the first line. The next 10 lines each show 10 variables. The variable list ends with an *s*, so, after *s* is shifted into variable %9, each line is one character shorter than the previous line. After the *s* is shifted out of variable %0, the program terminates and returns to DOS.

The preceding example used single letters, but each parameter may contain several characters. The only limitation on the variables entered on the command line is that the command line itself may contain a maximum of 127 characters.

You can use the SHIFT command in two ways. First, you may use it in a linear fashion within a batch file to access more than nine command-line parameters. For example, you might need to perform a multifile COPY operation, in which all of a certain number of files—perhaps 15 of them—would be specified on the command line. Sample 10 shows one way of doing this. It

TIP DIRECTORY SORTS

In DOS 5 and later, the DIR command lets you sort a directory listing by filename, extension, time, and size. But if you've got an earlier version of DOS, you can accomplish the same things using DIRALPHA.BAT, DIREXT.BAT, DIRDATE.BAT, and DIRSIZE.BAT.

All four programs rely on SORT.COM and MORE.COM; consequently, these DOS utilities must be in the current directory or listed in your PATH statement.

Because directory dates are stored in mm-dd-yy format, you can use DIRDATE.BAT properly to sort only files created in the same calendar year.

• DIRALPHA.BAT sorts directory listings alphabetically by filename.

```
ECHO OFF
CLS
DIR| FIND/V "e"| SORT| MORE
```

• DIREXT.BAT sorts directory listings alphabetically by extension.

```
ECHO OFF
CLS
DIR| FIND/V "e"| FIND/V "<DIR>"|SORT/+10| MORE
```

• DIRDATE.BAT sorts directory listings by date.

```
ECHO OFF
CLS
DIR| FIND/V "e"| FIND/V "."| SORT/+24|MORE
```

• DIRSIZE.BAT sorts directory listings by file size.

```
ECHO OFF
CLS
DIR| FIND/V "e"| FIND/V "<DIR>"|SORT/+15| MORE
```


Sample 10: COPYMULT.BAT

```

ECHO OFF
COPY %1 B:
COPY %2 B:
COPY %3 B:
COPY %4 B:
COPY %5 B:
COPY %6 B:
COPY %7 B:
COPY %8 B:
COPY %9 B:
SHIFT
COPY %9 B:
SHIFT
COPY %9 B:
SHIFT
COPY %9 B:
SHIFT
COPY %9 B:
SHIFT
COPY %9 B:

```

should be obvious that it's not a very good method. If the user enters more than 15 filenames, those in excess of 15 are lost. If the user enters fewer than 15, DOS gurgles up rude error messages. You also may use SHIFT to perform parameter shifting. MCOPY.BAT, shown in Sample 11, is a batch-file program that copies a variable number of files (as specified on the command line) to drive B.

The program works by first checking to see whether variable %1 is null (empty). If it is, the program exits with the message, "All done!" Otherwise, it copies the file to drive B and performs the shift. Then it checks variable %1 again. The loop continues until a shift produces a

Sample 11: MCOPY.BAT

```

ECHO OFF
:START
IF %1==/ GOTO END
COPY %1 B:
SHIFT
GOTO START
:END
ECHO All done!

```

null variable %1.

You may find it useful to keep several versions of MCOPY.BAT around for copying files to various disk drives and subdirectories. Just change the drive designation in the fourth line to the desired destination.

When copying groups of files, you can save many keystrokes by using MCOPY or a variation of it.

The CALL Command

CALL is the final internal DOS batch-file command. Introduced in DOS 3.3, CALL lets one batch file call another batch file as if it were a subroutine. When the called batch file terminates, it passes control automatically back to the original batch file.

Sample 12: MAIN.BAT

```

ECHO OFF
ECHO MAIN is calling SUB...
CALL SUB
ECHO ...MAIN is back in control
:END

```

CALL commands may be nested, meaning one file can call a second that can call a third, and so on. Provided there is some means of escape, a batch file even may call itself!

You can see how CALL works by creating the two batch files shown in Sample 12 and Sample 13. MAIN.BAT, shown in Sample 12, displays a short message before passing control to SUB.BAT, shown in Sample 13. SUB displays a short message, then passes control back to MAIN.

Execution Speed and Storage

Batch files run slowly, so you'll probably want to optimize the performance of those you expect to use regularly. As a general rule, batch files will run slowest on floppy drive systems, faster on hard drive systems, and fastest on systems with RAM disks. If you don't already use

Sample 13: SUB.BAT

```

ECHO OFF
ECHO ...SUB got control from MAIN
ECHO and is sending it back...
:END

```

a RAM disk, consider creating a small one—a few thousand bytes is sufficient.

Hard disk users have found that it is best to organize all of their batch files in one subdirectory. You then can easily copy often-used batch files to a RAM disk as part of your boot procedure. Make sure, though, that you include your batch subdirectory in your PATH statement.

If you use the ECHO command to display a lot of information, you can speed execution by placing the echoed information in a separate file. Rather than use ECHO, use the TYPE command to display it. In the example below, for instance, the help information is contained in an ASCII file called HELPINFO.TXT:

```

ECHO OFF
TYPE HELPINFO.TXT
:MAINLOOP
COMMAND 1
COMMAND 2
COMMAND 3
GOTO MAINLOOP

```

A number of small batch files can take up a great deal of disk space. A file that's only 10 bytes long, for example, takes at least 512 bytes of disk space on a floppy disk. On a hard disk, depending on your DOS version, the same file can take up to 8,092 bytes!

You can reduce clutter and save space by combining several related batch files into a single one. Batch files that set your printer for different modes are perfect candidates.

That wraps up this discussion of the eight internal DOS batch commands. You now have the basic tools for building all sorts of useful batch files. ■

Raise Your Batch File IQ

Add brainpower to your batch files by tapping the resources of the DOS environment space.

by Dave Rowell

If you write batch files, you should know about the environment. That doesn't mean that reading up on the effects of acid rain will give you new insight into the mysteries of batch files. The environment you need to be more aware of is the storage area known as the MS-DOS environment space. Tapping its resources is one way to get your batch files to do more.

Although the primary function of this 160-byte "message pad" (256 bytes in DOS 5 and later) is to provide DOS with a place to leave notes to itself, batch files can post messages there, too. This capability gives batch files long-term memory. A batch file can use the environment to record an event and later refer to the environment to "remember" what happened. Even more important, a batch file can analyze the contents of an environment message and make a decision based on what it finds. A batch file also can retrieve messages left by other batch files.

Although mastering all this might sound difficult, it really doesn't take long if you're already familiar with batch files. The key lies in properly managing environment variables (see the sidebar "Enlarging the Environment").

Environment Variables 101

The best way to begin is by inspecting the contents of

your current environment. If you type the SET command at the DOS prompt, DOS will display a list of environment strings similar to the following:

```
COMSPEC=C:\COMMAND.COM
PROMPT=$P$G
PATH =D:\BATCH;C:\DOS;D:\UTILS
```

The first string, which always is present because DOS puts it there, defines the environment variable COMSPEC. COMSPEC holds the location and name of your command processing program. Unless you substitute another command processor, COMSPEC lists the whereabouts of DOS's command processor, COMMAND.COM. COMMAND.COM is the program that displays the DOS prompt, executes DOS commands, and runs your programs.

The example environment comes from a hard drive system. If you boot DOS from a floppy disk in drive A, COMSPEC shows that COMMAND.COM is on drive A rather than drive C. The syntax of an environment variable always is the same: first a variable name in uppercase characters, then an equal sign, and lastly characters in the information following the equal sign may be upper- or lowercase.

If you change the DOS prompt with the PROMPT command, or set the directory path DOS uses to find executable files, you'll also see PROMPT and PATH in the list of variables that SET produces. If you see PROMPT and PATH in your environment and don't remember putting them there, that means your AUOTEXEC.BAT file probably contains a PATH or PROMPT command.

Free Exchange of Information

You don't need many tools to use environment variables in batch files. To add, change, or remove a variable, you use the same SET command that displays the contents of the environment. To create the variable USER with contents *John*, for example, you type:

```
SET USER=John
```

Then invoke SET, and you'll see that the following line is in the environment:

```
USER=John
```

You can type the variable USER in upper- or lowercase letters, but DOS always converts variable names to uppercase. The information you store in the variable remains as you type it. You can use (on either side of the equal sign) almost any character in the extended ASCII set, including the hieroglyphics with codes higher than 127. But COMMAND.COM interprets the greater than (>), less than (<), and vertical bar (|) symbols as redirection symbols, and codes below 32 may produce unpredictable results.

To change the contents of an environment variable, you issue the SET command again and substitute the new information. To change the contents of USER from *John* to *Mary*, for example, you type:

```
SET USER=Mary
```

Spaces are valid characters in environment variables, but be careful where you place them. Confusion can arise if you put spaces around the equal sign in a SET command. Spaces immediately before the equal sign become part of the variable name, and spaces trailing the equal sign become part of the information stored in the variable. Adding spaces around the equal sign in the above example, for instance, creates a five-character environment variable (USER plus a trailing space) and assigns it a five-character value (a leading space and the name *Mary*).

Variable Access

After you create an environment variable, the next step is to write a batch-file command that can read it from the environment. The syntax for doing this is straight-

forward: You simply enclose the variable name between percent signs (%). If, for example, you want to greet the person whose name resides in USER, you can add a line such as the following to a batch file:

```
ECHO Howdy, %USER%.
```

If the variable USER contains *John* when DOS processes the above line, the following message appears on screen:

```
Howdy, John
```

After your batch file uses an environment variable, it's wise to issue another SET command to remove it from the environment so that you don't run out of storage space later. To delete an environment variable, you type the SET command, the variable name (USER, in this case), and an equal sign, as follows:

```
SET USER=
```

You also may use a batch file to transfer the contents of one environment variable to another environment variable. Here, again, you use percent signs, but only around the variable you are reading from the environment. For instance, to assign the contents of PATH (your directory search path) to the variable OLDPATH, you'd use the line:

```
SET OLDPATH=%PATH%
```

You might use this command line to save your directory path if you have a batch file that changes the path before it runs a complex application. When the application ends, the following line restores the original path:

```
SET PATH=%OLDPATH%
```

The SET command is flexible. You may, for instance, use the same variable name on both sides of the equal sign to good advantage. The following short batch file, ADDPATH.BAT, lets you add subdirectories to the existing path list without retyping the entire list:

```
ECHO OFF  
SET PATH=%PATH%;%1
```


ENLARGING THE ENVIRONMENT

The environment's 160 bytes of storage space (256 bytes in DOS 5 and later) can fill up quickly. Fortunately, all is not lost if DOS sends you an "Out of environment space" error message. If you have DOS 3.1 or later, you can gain elbow room by calling your CONFIG.SYS file into your word processor (provided it can save information in ASCII format) and adding a SHELL command to increase the size of the environment.

Make sure that you have a bootable floppy disk before you start experimenting with SHELL on a hard disk. If you make a mistake, you may not be able to boot from your hard disk. You then would have to boot from your floppy disk and modify the errant CONFIG.SYS on your hard disk.

The only other trick to using SHELL is that the command's syntax requires you to provide the name of an alternative command processor (or shell program). You can get around this obstacle by using COMMAND.COM as a substitute for itself. The following typical SHELL statement shows how this works:

```
SHELL=C:\COMMAND.COM C:\ /P /E:320
```

The full pathname immediately to the right of the equal sign tells DOS to go to the root directory of hard drive C and run COMMAND.COM. The remaining information in the statement provides the parameters for COMMAND.COM.

The first parameter, C:\, tells COMMAND.COM where to find itself. (COMMAND.COM assumes it's in the boot drive's root directory.) If you put COMMAND.COM in another subdirectory, you must supply the subdirectory name. In the following SHELL statement, for example, COMMAND.COM resides in the \DOS subdirectory:

```
SHELL=C:\DOS\COMMAND.COM C:\DOS /P /E:320
```

COMMAND.COM stores the information from the first parameter in the environment variable COMSPEC. COMMAND.COM needs to know its own location, because part of the program sits at the high end of memory, where a large program might overwrite it. When that program ends, COMMAND.COM checks COMSPEC to locate itself and reload into the high end of memory.

The /P parameter tells COMMAND.COM that it's the parent, or original, command processor. Without /P, COMMAND.COM doesn't run AUTOEXEC.BAT. The parent parameter also prevents COMMAND.COM from responding to DOS's EXIT command. If you omit the /P parameter, COMMAND.COM bombs whenever you invoke the EXIT command.

The /E parameter sets the size of the environment—320 bytes in the above example. In version 3.1 of DOS, you type the number of 16-byte paragraphs you need for the environment space (as many as 62 paragraphs, or 992 bytes). For DOS 3.2 or later, you supply the number of bytes you want to reserve. Although you specify environment size in bytes (the maximum is 32,768 bytes), DOS still allocates space in units of 16 bytes.

When you create a secondary (child) copy of COMMAND.COM, DOS doesn't pass on a copy of the expanded environment, unless you fill it with variables. DOS passes on a space large enough to hold all defined variables, or 160 bytes (256 bytes in DOS 5 and later), whichever is larger. If you execute COMMAND.COM as a child process and want to enlarge the child COMMAND.COM's environment, you must use the /E parameter when you invoke the child COMMAND.COM. Specifying COMMAND.COM with the SHELL command rather than letting DOS run it automatically doesn't take extra memory, unless you expand the environment. In that case, the only cost is the extra size of the environment.

—D.R.

To add the subdirectory C:\TEST to the current path, you simply type the line that follows at the DOS prompt:

```
ADDPATH C:\TEST
```

ADDPATH tacks the path you supply onto the end of the current PATH variable and adds the necessary semicolon for you.

In many situations, reading an environment variable from a batch file does little good unless the batch file can make a decision based on what's in the variable. The IF construction lets you do this. If, for example, you add the following line to

a batch file, DOS displays a message only if the variable USER contains the word *Fred*:

```
IF %USER%==Fred ECHO Fred is the
user (not FRED or fred).
```

If it matches, then the ECHO statement executes, and the message is displayed. If they're not the same, DOS skips the ECHO statement.

The double equal sign, like the double equal sign in C language, compares the information to its right and left. As in previous examples, you can type variable names in upper- or lowercase; DOS converts them to uppercase. However, DOS

doesn't alter the case of the information to the right of the double equal sign. If you don't want Fred to get the message, you can use:

```
IF NOT %USER%==Fred ECHO Fred
won't see this (but FRED or
fred will).
```

To execute more than one batch file command, you'll need to put a GOTO command in your IF statement. In the following example, control jumps to the label :JOHNS-ROUTINE whenever the environment variable USER contains *John*:

```
IF %USER%==John GOTO JOHNSROUTINE
```


Finally, if you use an environment variable as a flag or to pass information between batch files, you may need to test whether the variable exists before trying to evaluate it. To make this test, you compare the variable with nothing:

```
IF "%TEST%"=="ECHO there is no
environment variable named TEST.
```

The only trick here is that you must make sure at least one character remains on each side of the double equal sign when the variable you're testing is empty; otherwise, the line bombs, and DOS gives you a syntax-error message. You don't need to use quotation marks. A line similar to the following works just as well:

```
IF/%TEST%==/ ECHO No TEST here
either.
```

If TEST doesn't exist, the IF statement compares the slash (/) to the left of the double equal sign to the slash on the right, finds that the expression is true, and displays the message. As with SET, any spaces around the equal signs become part of the comparison.

Secure Files

It's hard to appreciate the power of environment variables without see-

ing examples of batch files that employ them. To give you a strong start, I'll apply the techniques outlined above and show how a set of batch files can manage the protection status of disk files. The batch files are based on the DOS ATTRIB command (available in DOS 3.0 and later), which lets you control whether you can write to a file. Normally, DOS creates files you can both read from and write to. Changing a file's status to read-only provides a measure of security; you can't alter, write over, or delete a read-only file using DOS commands or most applications.

To protect a file from being overwritten, you use the following syntax:

```
ATTRIB +R filename
```

To get rid of write protection, you substitute a minus sign for the plus sign:

```
ATTRIB -R filename
```

The first sample batch file, KEY.BAT, uses an environment vari-

KEY.BAT changes the write-protection status of a subdirectory, turning it off if it is on and vice versa.

```
ECHO OFF
IF "%KEY%"==" GOTO UNLOCK
:LOCK
ATTRIB +R *.*
SET KEY=
SET PROMPT=%OLDPROMPT%
SET OLDPROMPT=
GOTO END
:UNLOCK
SET KEY=OPEN
ATTRIB -R *.*
SET OLDPROMPT=%PROMPT%
SET PROMPT=%PROMPT%$L UNLOCKED $G
:END
```

End

able as a flag to remember a past event. Whenever you run the program, you change the status of write protection, turning it off if it is on, and vice versa.

I use this file to protect all the files in a given subdirectory. When I need to edit one or more files that I have protected, I run KEY.BAT once to turn off write protection. Then I make the changes and run KEY.BAT again to turn protection back on. The variable KEY is the flag that determines which action the program takes. The core of the program follows:

```
IF "%KEY%"==" GOTO UNLOCK
ATTRIB +R *.*
SET KEY=
GOTO END
:UNLOCK
SET KEY=OPEN
ATTRIB -R *.*
:END
```

If the variable KEY doesn't exist in the environment, the program jumps to the :UNLOCK label and unlocks all files in the current subdirectory. It then stores the word OPEN in the environment variable KEY to signal that protection was turned off. When the program runs a second time, the variable contains OPEN; as a result, the test on the first line fails. The program therefore sets the attribute of all files to read-only and removes KEY from the

TIP DRAWING A BLANK

You can use BLANK.BAT to extend the life of your monitor screen by blanking the display when you're not using the computer. You first must load the ANSI.SYS display and keyboard driver by adding this line to your CONFIG.SYS file:

```
DEVICE=ANSI.SYS
```

(Reboot your system to have the command take effect.)

BLANK.BAT temporarily blanks your screen.

```
PROMPT $E[0;30m$E[2J
PAUSE
PROMPT $E[0m
ECHO OFF
PROMPT $D It is now $T$H$M$S$P$G
CLS
```


environment.

The listing for KEY.BAT shows the full program. I added one other feature to make the batch file safer: When it unlocks the subdirectory, the batch file adds the word UNLOCKED to the DOS prompt to indicate that those files no longer are protected. You then get a constant reminder to run the program again after you make changes.

KEY.BAT saves the existing prompt (in an environment variable) before changing the prompt. When you run KEY.BAT again, it locks up the files, restores the prompt to its former state, and removes the OLD-PROMPT variable from the environment, conserving space.

Please Pass the Data

For those times when I want to protect only some files in a directory, I have another set of batch files, LOCK.BAT and UNLOCK.BAT. They show how you may use environment variables to pass information between two batch files and how each batch file can work independently on a file or on all the files in the current directory if you don't specify a filename.

Both batch files assume that if you unlock files, you'll want to lock them again later. UNLOCK.BAT, therefore, saves under the environment variable LOCK and file specification (the name of the file or wildcard if you unlock more than one file) it unlocks. You then may lock those files just by running LOCK.BAT, which reads LOCK from the environment—if it exists.

The following lines in UNLOCK.BAT do the work:

```
SET LOCK=%1
IF "%1"==" " SET LOCK=*. *
ATTRIB -R %LOCK%
```

The first line stores the first command-line parameter (%1) in the variable LOCK. However, if you do not provide a parameter, UNLOCK.BAT assumes you want to unlock all files (*. *). The ATTRIB command then uses LOCK to determine on which files to act.

Because it must interpret several parameters, LOCK.BAT is a little more complex. If you invoke LOCK.BAT and include the name of the file (or files) to lock, the batch file stores that information (%1) in the variable LOCK. If you don't supply a parameter, LOCK.BAT uses the existing variable LOCK to determine on which file to act. But before blindly trying to use LOCK, LOCK.BAT tests for its existence. If you don't specify a command-line parameter (%1) and the environment variable (%LOCK%) doesn't exist, LOCK.BAT assumes you want to lock the directory. If LOCK exists (because UNLOCK.BAT set it), the batch file acts on the file or files the variable specifies. The important lines follow:

```
IF "%1"==" " GOTO
NOPARAM
SET LOCK=%1
GOTO LOCK
:NOPARAM
IF "%LOCK%"==" " SET LOCK=*. *
:LOCK
ATTRIB +R %LOCK%
SET LOCK=
```

The listings for LOCK.BAT and UNLOCK.BAT show the full-blown versions of the batch files. They contain additional lines that keep you informed about what's going on as the programs run. LOCK.BAT tells you the name of the file (%LOCK%) it's trying to write-protect as well as whether the file exists. If you read its messages, you won't make any incorrect assumptions about the protected status of important files.

UNLOCK.BAT also has a test to ensure that the file you want to act on exists. This prevents UNLOCK.BAT from creating the LOCK variable for a nonexistent file.

LOCK.BAT sets write protection for files you have specified.

```
ECHO OFF
IF "%1"==" " GOTO NOPARAM
SET LOCK=%1
GOTO LOCK
:NOPARAM
IF "%LOCK%"==" " SET LOCK=*. *
:LOCK
IF NOT EXIST "%LOCK%" GOTO NOFILE
ATTRIB +R %LOCK%
ECHO File(s) %LOCK% are write-protected.
GOTO END
:NOFILE
ECHO File(s) %LOCK% not found.
:END
SET LOCK=
```

End

UNLOCK.BAT removes write protection from files you have specified.

```
ECHO OFF
SET LOCK=%1
IF "%1"==" " SET LOCK=*. *
IF NOT EXIST %LOCK% GOTO NOFILE
ATTRIB -R %LOCK%
GOTO END
:NOFILE
ECHO File %LOCK% not found.
SET LOCK=
:END
```

End

A Final Note

Writing a batch file to solve a particular problem is an exercise in making do. You need all the tools and techniques you can find. But before you start adding environment variables to your batch files, you should know one last thing. When you write a batch file that calls another batch file by running a second copy of COMMAND.COM (with the /C parameter), you can pass information only in one direction—from the parent to the child. That's because the child COMMAND.COM has access to a copy, rather than the original version, of the parent environment. If the called batch file makes changes to its copy of the environment, those changes are temporary. They don't affect the original environment, and they disappear when the child COMMAND.COM finishes executing. ■

List 'Em by the Batch

APT.BAT is a handy batch-file program that helps you manage your appointments, records, and any quick list you care to create.

by Harry Bee

I gave up long ago on software appointment calendars. My disappointment with them applies equally to the bound appointment books sold in stationery stores: None of them acknowledges that I may, and usually do, schedule appointments before 8 o'clock in the morning, after 6 P.M., and on weekends. Because I couldn't find a software appointment minder that satisfied me, I decided to write my own: a batch file I call APT.BAT (see the program listing). I use it to keep a telephone book, to start outlines, and to build to-do and shopping lists.

When you need to write an application such as this, usually you don't think of using DOS's batch processing language. Batch programs control your applications: They change directories, adjust the environment, load memory-resident utilities, and start programs with the right switches set. APT is an exception to the rule. It's a list manager with which you can build, edit, sort, search, display, and print lists.

To create APT, you need a text editor or a word processor. (Unless you're an extremely accurate typist, the program is too long for you to use the COPY CON method of writing batch files.) If you're using DOS 5 or later, you can employ its full-screen editor, EDIT. Of course, EDLIN, the line editor that accompanies DOS 5 and earlier, also can do the job. If you use a word processor, be certain to press Enter at the end of each line and save

the file in ASCII (text) format.

APT relies on the services of three programs: the text editor of your choice and the DOS utilities SORT and FIND. If you use a hard disk, APT will find these programs, as long as the directories that contain them are listed in the PATH statement in your AUTOEXEC.BAT file. You must store the program listing BOOK.HLP, which is a text file, in your root directory, unless you change the line in APT that displays it. If you want to carry your appointments around with you on a floppy disk, be sure to copy SORT, FIND, your editor, and BOOK.HLP onto the same disk as APT.

Making Lists

After typing in the program listings and placing them in the appropriate directories for your system, you're ready to build a few lists.

To use the program's various functions, you type at the DOS prompt the program's name followed by a one-character switch. All switches must be in lowercase. For example, typing this command tells APT that you want to e the entries in your appointment calendar:

```
APT e
```

When you type this command, the program displays a series of help screens:

```
APT ?
```

These help screens provide a quick overview of APT's

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APT.BAT is a simple list manager.

```

ECHO OFF
:
REM Set APTEDIT to point to your text editor
REM Set APTFIND=/I if you want to ignore case
REM when conducting searches.
:
SET APTEDIT=EDIT
SET APTFIND=
:
REM APT.BAT
:
REM A list management system.
REM Use it to manage to-do lists, appointment
REM minders, telephone books, outlines, or any
REM sort of list that needs on-the-fly management.
:
:START
IF "%1" == "" GOTO END
IF %1 == a GOTO ADD
IF %1 == s GOTO SORT
IF %1 == e GOTO EDIT
IF %1 == l GOTO LIST
IF %1 == p GOTO PRINT
IF %1 == d GOTO DELETE
IF %1 == c GOTO CLEAR
IF %1 == ? GOTO HELP
SHIFT
ECHO %0 %1 %2 %3 %4 %5 %6 %7 %8 %9 >> \BOOK.APT
GOTO END
:ADD
ECHO.
ECHO Type one item per line.
ECHO End each line by pressing Enter.
ECHO Make F6 (Ctrl-Z) the last item.
ECHO.
COPY \BOOK.APT + CON \BOOK.APT > NUL
:SORT
ECHO Sorting...
ECHO.
TYPE \BOOK.APT | SORT > \BOOK.APT
SHIFT
GOTO START
:EDIT
%APTEDIT% \BOOK.APT
GOTO SORT
:LIST
IF "%2" == "" GOTO DISPLAY

```

```

FIND %APTFIND% "%2" < \BOOK.APT
GOTO END
:DISPLAY
MORE < \BOOK.APT
GOTO END
:PRINT
ECHO.
ECHO Put printer on line.
PAUSE
VER|DATE|FIND /I "IS" > PRN
IF "%2" == "" GOTO ALL
FIND %APTFIND% "%2" \BOOK.APT > PRN
GOTO END
:ALL
ECHO --- > PRN
TYPE \BOOK.APT > PRN
GOTO END
:DELETE
IF "%2" == "" GOTO ERR
:NEXT
FIND %APTFIND% "%2" < \BOOK.APT
ECHO.
ECHO The above item(s) will be deleted.
ECHO Press Ctrl-Break to abort or
PAUSE
FIND %APTFIND% /V "%2" < \BOOK.APT > \TEMP.APT
SORT < \TEMP.APT > \BOOK.APT
SHIFT
IF NOT "%2" == "" GOTO NEXT
DEL \TEMP.*
GOTO END
:ERR
ECHO Delete requires a second parameter.
ECHO Type APT ? for help.
GOTO END
:HELP
CLS
TYPE \BOOK.HLP | MORE
GOTO END
:CLEAR
ECHO WARNING: Your list will be completely cleared!
ECHO Press Ctrl-Break to abort or
PAUSE
DEL \BOOK.APT
:END
SET APTEDIT=
SET APTFIND=

```

End

capabilities, explain the switches, and offer suggestions for using the program efficiently.

To start a list or add a line to it, type the program's name followed by the line you want to add. For example, if you type:

```
APT Call Mom Monday
```

the program adds the message "Call Mom Monday" to your list. You can add more than one line at a time to the list by typing:

```
APT a
```

The program then prompts you to type your list of items, reminding you to press Enter at the end of each line. When you're finished, you must press the F6 key or press Ctrl-Z and then Enter.

You sort the list by using the s (sort) switch. APT uses DOS's SORT program to sort lines. This means that the word with which you begin an entry in your list determines that entry's order in the sorted list.

The e (edit) switch loads the list into your editor so

TIP GET BACK WHERE YOU BELONG

Here's a low-tech solution for saving your current drive and directory so that you can return to that location again later. This technique involves three files. GRABLOC.BAT saves the drive and current directory name to disk files and uses these files to build a batch file called GOBACK.BAT. When you run GOBACK.BAT, it returns you to the original drive and directory. During the process, the third file, CDPART, is tacked onto the subdirectory pathname.

You create GRABLOC.BAT as you would any batch file, but CDPART requires special handling. It contains only the command CD (CHDIR) followed by a space; it may not include an Enter character. You may create this file using one of DOS's text editors, EDLIN or EDIT.

To use EDLIN, start by typing:

```
EDLIN CDPART
```

At the asterisk prompt, type I (for *insert*) and press Enter. At the prompt (the number 1 followed by an asterisk), type:

```
CD ^Z
```

(Press F6 or Ctrl-Z to produce ^Z.) Press the Enter key to get to line 2. On line 2, press the F6 key and Enter again to exit line-insertion mode. At the asterisk prompt, type E and press Enter to save the file and exit EDLIN.

To use EDIT, type:

```
EDIT CDPART
```

In the blank editing window, type CD followed by a space. Next, press Ctrl-P followed by Ctrl-Z. This tells EDIT to interpret the Ctrl-Z as the end-of-file character ^Z instead of as a command. Now save the file by pressing Alt-F to bring down the file menu and typing X to exit and Y to save the file.

As written, GRABLOC.BAT assumes that you have a DOS subdirectory on drive C and that your PATH statement points to that subdirectory. Change the pathnames used by OLDDIR, OLDRIV, CDPART, and GOBACK.BAT if you store these files elsewhere.

SAMPLE.BAT shows how to use GRABLOC.BAT. It runs the program, initiates a word processing session, and returns you to the original directory when that session ends.

GRABLOC.BAT stores your current drive and directory by creating the batch file GOBACK.BAT, making it possible to return to the original drive and directory later.

```
REM Save the subdirectory name to the file OLDDIR
CD > C:\DOS\OLDDIR
REM Save the drive letter to the file OLDRIV
CD \
CD > C:\DOS\OLDRIV
REM Copy drive letter into first line of GOBACK
REM Copy CD and OLDDIR into second line of GOBACK
COPY C:\DOS\OLDRIV + C:\DOS\CDPART/A + C:\DOS\OLDDIR
C:\DOS\GOBACK.BAT
```

SAMPLE.BAT shows how you might use GRABLOC.BAT.

```
ECHO OFF
CALL GRABLOC
C:
CD\WORDPROC
WORDPROC
GOBACK
```

that you can edit it. You can use the edit function to look at your list, clean it up, and add or delete items. You tell APT the name of your editor in the sixth line of the batch program. As written, the program tells DOS to use EDIT. To specify another editor, EDLIN for example, substitute its name for EDIT's. EDLIN is hardly the finest program of its kind, and it's far from easy to use. So if you have a text editor or word processor you're comfortable with, use it instead.

To look at an entire list a page at a time, invoke APT with the l (list) switch. When you want to find particular items, add the search string after the l switch. If, for example, you want to see all the lines in your list that mention the word "alligators," type:

```
APT l allig
```

The p (print) switch, which sends the list to your printer, works the same way as the l switch. To print an entire list, type:

```
APT p
```

To select entries that mention "alligators," type:

```
APT p allig
```

By default, the string searches performed by APT are case sensitive. The string ALLIG, for example, won't find lines that contain the word "alligator." If you use DOS 5 and later, however, you can eliminate this restriction by changing the seventh line of APT to read as follows:

```
APTFIND=/I
```

This tells FIND to perform all string searches without regard to case.

When you want to remove lines with the d (delete) switch, you must include one or more search strings. For example, typing:

```
APT d alligator
```


rides the list of all lines that include the word "alligator." Typing:

```
APT d alligator walrus
```

deletes lines that mention "alligator" and "walrus."

You can wipe out the whole list and start over with the c (clear) switch.

APT stores the list you create in a file called BOOK.APT. To keep several lists, I use a separate version of the program for each one. APT.BAT keeps my appointments; a copy of the program named TEL.BAT keeps a list of telephone numbers. For to-do lists, you can call the program DO.BAT, and for grocery lists, SHOP.BAT.

To keep the lists separate, change the extension of the book file in each version of the program. My telephone book, for example, is BOOK.TEL.

The data file that APT creates, BOOK.APT, resides in the root directory. If you want to keep it elsewhere, you must change all references to it in APT.

Final Notes

While DOS's FIND and SORT are free, you can find faster and more capable, if not better, sort and search programs in any collection of DOS utilities. You also can find much better ways to print the list than what you see here. But don't, under any circumstances, use DOS's PRINT command. If you shell, or temporarily exit to DOS from within an application, such as a word processor or a spreadsheet, and use PRINT, PRINT installs part of itself, a memory-resident module, in memory above the application you're running. Thereafter, your word processor or spreadsheet won't have access to additional memory, and you may find that you can't add any more to the document or budget on which you're working. I use a print utility from The Norton Utilities collection that is safer and supplies margins, page breaks, and page numbers.

It's true that my list-management batch file isn't as slick as one you might write using a "real" program-

BOOK.HLP is a text file that displays help screens for APT.BAT.

To add a single item (line) to your list, at the DOS prompt type APT followed by the note you want to add. For example:

```
APT Call Carol about contract
```

adds "Call Carol about contract" to the end of the list.

SUGGESTIONS

1. For a to-do list, precede the note with a priority number (using zero for the highest priority and nine for the lowest) so that sorting puts the most important items at the top of the list.
2. In an appointment minder, begin each line with the date. If you use a consistent date format, you can keep the list sorted chronologically. In general, mm/dd is all you need. To take care of the transition from December (12) to January (01) at the end of the year, use 01 instead of 01 for January.
3. The most useful format for a telephone book is last name, first name, and number. However, APT.BAT will find an entry, or entries, if you search an area code, exchange, or part of a name, for instance.

SWITCHES AND SYNTAX

Type APT followed by one of the following switches to perform a specific operation on your list.

SWITCH	FUNCTION
a	Lets you add several lines to the list at once.
s	Lets you sort the list.
e	Lets you sort the list using the editor you specify.
c	Lets you clear the entire list.
l	Lets you display the entire list.
p	Lets you send the entire list to a printer.

With certain of the switches, you may add a string to restrict on which entries APT.BAT acts.

SYNTAX	FUNCTION
d string [string]	Deletes records containing the string or strings you specify. You may use as many as eight strings.
l string	Displays only the records containing the string.
p string	Prints only the entries that contain the string.

Three switches, a, s, and e, may be followed by another switch (and its parameter). The a and e functions finish by sorting. Notes entered individually from the DOS prompt may contain as many as 10 words. Use the a switch to enter longer items. Avoid using commas and the greater-than and less-than signs.

End

ming language. On the other hand, the original version of APT took less than an hour to write, it's easy to maintain and improve, and it works well enough that I'm still using it. ■

DRG MARKETPLACE

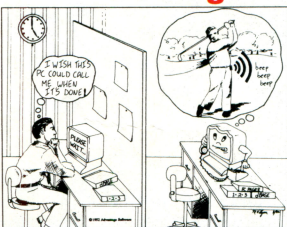
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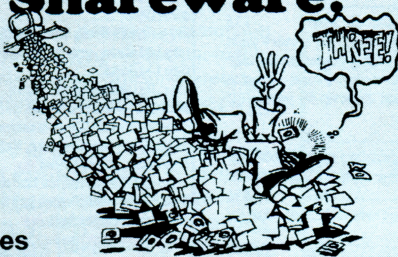
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Using Lotus 1-2-3, Advanced, 2.4 or 3.1 (ViaGrafix).....	M1342/3	\$45
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Miramax brings you 21 Award-winning computer animations, mixing humor, adventure, song and fantasy into 45 entertaining minutes. Also includes Todd Rundgren's music video "Change Myself," done using The Video Toaster's LightWave 3D software.		
Mind's Eye (Miramax)	V2043	\$16.95
An absolutely astounding look at the state of the art in computer animation. Let the talent of over 300 of today's hottest animators take you on a surrealistic journey through the universe of computer animation—complete with a choreographed, original score. 40 mins.		
Beyond the Mind's Eye Video (Miramax) New!	V2044	\$16.95
For all you computer animation fanatics, even more of what made Mind's Eye I a best-seller. 40 more minutes of eye-popping animation with an original soundtrack courtesy of Jan Hammer.		
Get both Mind's Eye and Beyond Mind's Eye	V2084	\$29.95
Chronos Video (Miramax)	V2045	\$16.95
Breathtaking 70mm cinematography captures the timeless beauty of Earth's most beautiful places. Including Stonehenge, the Pyramids, Athen's Acropolis, Mont St-Michel, the Arc de Triomphe, the Vatican and over 50 other locations.		
Mind's Eye on Laserdisc (CAV)	V4001	\$29.95
Beyond Mind's Eye on Laserdisc (CLV)	V4002	\$29.95

From DevWare Productions. Superb animations from Tobias Richter, one of Europe's best Amiga animators. Centerpiece is *Space Wars*, 8000 frames spanning 7 entertaining minutes with original soundtrack by Norwegian musician Bjorn A. Lynne. *Space Wars'* stunning, ray-traced animations took 5 Amiga computers over 4 weeks to complete. 40 minutes.

A Train (Maxis).....	A1154	\$43
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They're back - after they were the 1991 Game of the Year! Those lovable, green-haired numbskulls have populated every corner of Lemmingsland and have evolved into 12 distinct tribes, each with their own unique behaviors. Save them again, reaching an even higher level of intellectually challenging, fast-paced play.		
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Unless otherwise noted, the following minimum system requirements are required: 3.5" (720K or 1.4MB capacity) disk format, hard-disk, EGA or VGA graphics adaptor, 512K RAM and DOS 3.0 or above.

BEST SELLER

HAP02- Wolfenstein 3D: OUTSTANDING! This incredibly smooth moving fully-three-dimensional masterpiece definitely sets the standards. Full 360-degree panning makes it more of an interactive movie wherein you must escape from the terror of Castle Wolfenstein deep in Hitler's Europe. Digitized soundtrack on your AdLib or SoundBlaster. Req. 640K, 286+, VGA.

HGS01 - World Empire: A strategy game based on a time in the not too distant future when nationalism is on the decline. You must conquer the entire planet and institute a worldwide government of your own beloved ideology. EGA/VGA, 512K, mouse comp.
HGS02 - Tank Wars: A game for 1 to 10 players. Opponents attempt to destroy each other tanks by firing various weapons. There are also 7 computer intelligences available to compete against. VGA/MCGA x 256 colors, mouse compatible.

HGS03 - Oakflat Nuclear Power Plant Simulator: Try to run a light-water pressure fission reactor and generate electricity at a profit. Easy, huh?

HGS04 - Mah Jongg: Addictive solitaire game played with colorful Chinese tiles. Easy to learn but challenging to win. Includes tile editor utility for making your own tiles.
HGP01 - AquaMan/OilCap/JungleJack: In Aquaman, push various shaped pipe links to connect the two storage pumps. In Oil Cap its you against the clock as you try to create links which will allow the oil to flow freely. JungleJack puts you in the jungles to connect new buildings to a water supply. All very challenging.

HGC01 - CardSharks & Poker Galore: CardSharks plays Bacarat, Blackjack and Poker. Poker Galore is a Vegas-style video poker machine simulator.

HGC02 - Smart Gambler: A casino gambling tutor. Planning, tracking and reporting features demonstrate how to control and monitor play and most importantly how to better results.

HGA01AB- Stellar Defense: You're a star fighter in a desperate fight to save your galaxy from the relentless onslaught of the invaders. Pilot your ship in a free-movement spectrum while out-maneuvering your opponents in a series of conflicts by dodging realistic ray-traced asteroids and your opponents attacks. 2 disk set, counts as 2.

HGA02- Arcade Action: Mario Brothers VGA-just like the original! Moraff's Blast is a breakout game of the highest magnitude with many different options. Kaon is an incredible sideways-scrolling shoot'em up with incredible graphics and sound!

HGA03- Graphics Workshop: Works with bitmapped graphic files (MacPaint, GEM/IMG, PC Paint., GIF, TIFF, WPG, IFF, PIC, Targa, BMP, MSP, EPS, EXE, CUT, RLE & 24-bit). View, convert between, dither, reverse, rotate, flip, scale, reduce colors, sharpen, soften and do special effects...very powerful!

HGA04- Image Alchemy: This powerful image utility can convert between many popular bitmap graphic file formats. Also supports JPEG image compression.

HAB01 - Wampum 4.5: one of the database granddaddy's of the shareware revolution. A full assortment of database management features and with the lowest price in the world. Can load as a 20K TSR, dBASE-compatible

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reports and labels, the best form letters in the biz, a phone dialer, support for PCX graphics, fully relational, menu-driven DBMS includes PowerBrowse (a spreadsheet data manager).

HAB02- EZ-Forms Executive 4: Professional forms processor. Includes full math (40+ functions), forms upto 15 pages, full drawing, directory navigation, file compression, DES encryption, word-wrap, centering and justification., form-field user help and "pick lists", tab scheduling. Outstanding.

HAB03AB- Label Master 5.1: A complete mailing list management program that received the PC Magazine Editors Choice award. Maintains an unlimited number of names & addresses, prints lals of any size, bar codes and carrier routs, supports over 430 dot matrix and laser printers, has a form letter utility, superb report writer, Zip +4 conversion utility, duplicate checking, phone dialing and much more! Outstanding! 2 disk set, counts as 2.

HAB04AB- EZ-Forms DataBase: Gives you the capability to add, modify, sort, display and print all kinds of information in various different ways. This package can easily hold it's own against the commercial heavyweights. 2 disk set, counts as 2.

HAB05AB- Portfolio Manager: Tracks most market investments as well as CD's, Savings, limed partnerships, etc. PM can maintain up to 5 accts in 1 portfolio to separate your records for an IRA, spouses IRA, special purpose account, etc. PM will measure performance to meet long range goals. Computes R.O.I., estimated and actual yields, and other analytical data. Excellent tax preparation and planning tool...17 reports, menu driven w/mouse. 2 disks counts as 2.

HAB06- Vision: A Free form Textual Database system. The first access method is the usual hierarchial Chapter/Pages two-levels access. In this way you can read newspaper articles, documents, books, dictionaries, etc. Vision also allows you to access data in a hypertext method and allows you to create these-not a "read-only" package.

HA01- Cumberland Diary: a shareware application program to help you keep an organized diary or journal with headings that can be searched by date or heading. Visually attractive pop-up menus allow you to always know where you are and where you came from in the program. Built in word-processor is easy to use with cut-and-paste and a 60,000 word dictionary is available.

HWT01- Text Editors: Boxer features: multi-level undo/redo, full mouse, keyboard reconfig, 28/35/40/43/50 lines for E/VGA, multiple files/windows, column marking, macros and much more! MacroPik'r is a data format conversion program that supports and converts

between Lotus, dBASE, DIF, SYLK and fixed-length record files.

HES01- Educational: Brandon's BigBox has 22 fun educational modules for children ages 3 to 7. Play and learn keyboard skills, problem solving, matching games, matrix games, reading drills, alphabetic matching, memory, math, sight, counting by 2's and 5's and much more. DressMeUp is an imaginative paper doll game with a cute collection of animals to dress up as well.

HES02- Learning Skills: Math Maniac has drills for kids 4-12 with interactive testing, scores and printing of random lists. Spellbound is a spelling tutor. Mix and Match is a Tetris-type game, but with emphasis on mixing colors in fewest tries rather than within a certain time period.

HES03- Math/Educational: CalcJNC is the ultimate calculator. A programmer's calculator with Dec, Hex, Octal and Binary, Not, and, nand, or, xor, nor, negation and mod. Also has full floating point math with sq, cube, sin, cos, tan, hyp, pi, abs, logs, angles, sexagesimal...much more! Verbal Vanquish will help those help to prepare for the verbal portions of the S.A.T. & P.S.A.T. tests.

HGD01- Adventures: Moraff's World Ver 6...the ultimate dungeon game. 25 levels deep with the best 3D corridors ever seen in a computer game. Better than the commercial games...this sets new standards. Pharaoh's Tomb is a Mario Bros.-type game from Apogee software...explore the tomb and retrieve the treasures...don't forget to survive.

HGD02- Adventures: Dark Ages: Volume 1 is a brilliant arcade/adventure with superb graphics and animation with AdLib & Sound Blaster support. In Super ZZT journey through the giant 7-level Monster Zoo, shooting monsters and solving puzzles all the way, in this much-anticipated sequel.

HGD04- Maddog Williams Help Maddog save the princess. Includes SoundBlaster/AdLib support and joystick support (not required). Truly one of the best shareware games.

HGD05- Ken's Labyrinth The fate of Earth is in your hands! The scientific community on Planet Zogar has been searching the universe for the alien race most able to survive adversity. Find your way out of the labyrinth and everyone lives...you know what happens if you don't!

HGD06ABC- Megatron VGA: A 1 or 2 player game. The object is to use your giant robot to hunt down and destroy your adversary. You don't know where he's hiding, all you have to work with is a 3-D view of the corridor your standing in, a topdown view of the labyrinth, and a changing sonar blip that can guide you.

HGD07- Adventure Games: Commander Keen in "Goodbye Galaxy" an outstanding platform, adventure, arcade, strategy graphic game...four stars. Arctic Adventure is a similar game with Jumpman-style puzzles to solve.

HGD08- Adventure Games: Apogee's Crystal Caves...another incredible graphic adventure, strategy, addictive game. Also contains ZZT.

HGB01- Mind Games: PuzzleMaster scrambles pictures and challenges you to rebuild them. MindCube's objective is to rearrange blocks so that you can achieve each level's goal of getting all 10 special tiles.

HAG01AB- Apple II Emulator: Emulates an Apple II computer on your 286/386. Two disk set, counts as two.

HAG02AB- VGA CAD: A very complete and powerful Computer Aided Design (CAD) package. With such packages, you can create floorplans, ships, cars, components, anything you can think of can be represented, edited and refined inside the computer. Requires VGA, 512K and mouse strongly recommended.

HGV01- Image Tools: Contains JPEG con-

version utilities and Compushow which makes viewing bitmap pictures a breeze.

HGE01- Eye Candy: Dazzle is an interactive color kaleidoscope program for many hours of changing visual viewscapes. Also includes Lumen2, VGA Rain and a demo of Superscape Virtual Reality software...all for VGA.
HUP01- Disk Spool II: Sets up a print spooling environment where printed output is spooled to disk, rather than to memory. Includes many advanced features, yet is simple to install and use. Now in its 8th year!
HUD01- : ORG is a hard-disk organizer utility. QCopy is a powerful and fast disk copier that optimizes while copying. ElFTree packs 100's of FAST file, directory and program management utilities into one incredible program. Extract 2 will dissolve .ZIP/.LZH/.ARC files in a snap.

HUS01- Speedkit: Contains shareware versions of world famous HyperDisk, HyperKey and HyperScreen utilities.

HUS02- The Last Byte Memory Manager: Loads device drivers, TSRs, and more between 640k and 1 meg. Compatible w/DOS 5, Windows 3.1 and all protected mode software. Requires 8088 or above and supported shadow controller ram controller, EMS, or R/W RAM in the UMA.

HGG01- Graphics: TurboPaint is an alternative to PC Paintbrush and DPaint. Runs in tight memory and supports Tandy 16-color mode. DosClip lets you grab standard and extended VGA mode text screens and standard VGA mode graphics screens to PCX files. WinCapture does the same, but saves to BMP, GIF, PCX, PIC, TGA, TIFF or WPG.

APOGEE SOFTWARE

Multi-award winning makers of the hottest shareware products in the world!

HAP01- Duke Nukem and Secret Agent: The Hunt for Red Rock Rover: Both of these continue Apogee's excellent reputation of the best games in the biz. Explore vast worlds with killer graphics and sound effects.

HAP03- Commander Keen, Part 4: Goodbye Galaxy Episode One--Secret of the Oracle: Winner of the ShareWare Industry Award for "Best Entertainment" and "Best Overall" program! This action/adventure game will blow your socks off with it's fluid animation and over 1 meg of graphics! Don't miss this one! Requires 640K, EGA/VGA, harddrive.

HAP04- Command Keen in "Invasion of the Vorticons"--Episode One--Marooned on Mars and Word Rescue Part One Another outstanding installment in the Commander Keen series with all the animation, music, arcade action and adventure you demand from Commander Keen! Word Rescue employees an ingenious arcade action/adventure game to teach children invaluable spelling and word lessons...all the fun of Commander Keen plus a great learning tool!

HAP05- Major Stryker: A scrolling shoot'em up of the highest caliber. Smooth scrolling arcade action and great graphics ensure you'll be back for plenty more!

HAP06- Cosmo's Cosmic Adventure: Smooth, fast and bursting with arcade action and adventure in this imaginative creation from Apogee. Help Cosmo find and rescue his parents from an evil space beast. Requires 640K, EGA or VGA and hard disk.

HAP07- Math Rescue: In this great new arcade adventure for ages 4-14, you must stop the Gruzzles and their insatiable appetite for numbers...restore all the numbers before they disappear forever! Learning can be fun with this gas outstanding graphics and pulse-quickening action! Req. 640K, EGA or VGA, DOS 3.3 or higher and a hard disk.

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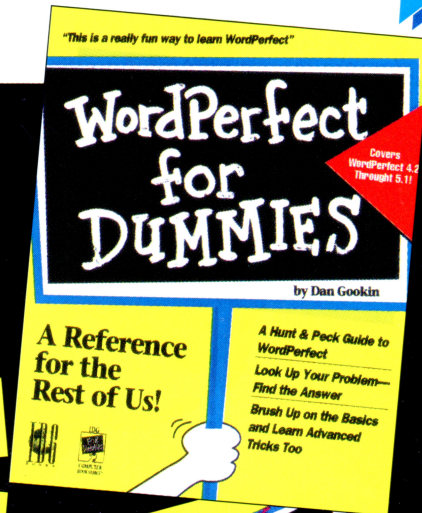
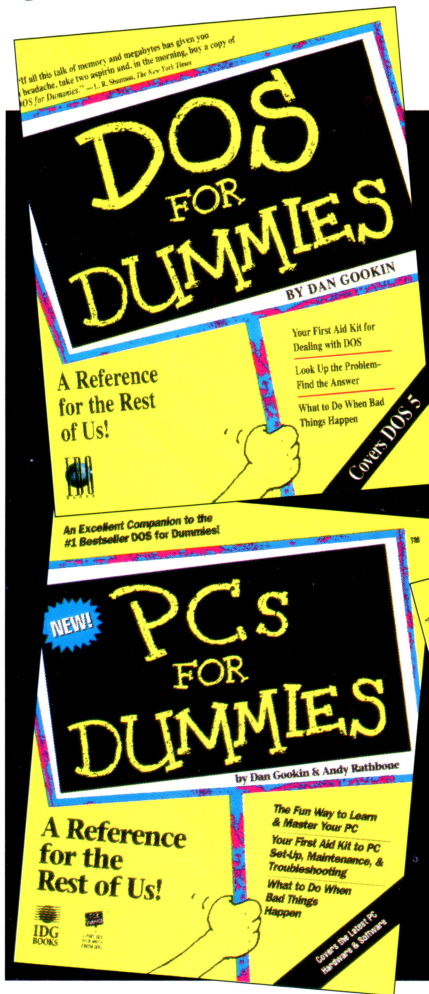
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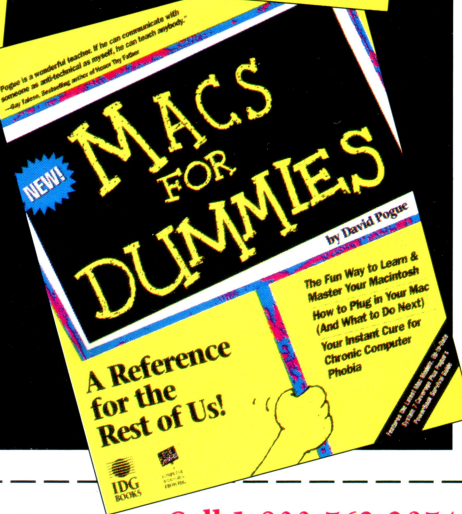


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Introducing QEMM 7 The Memory Manager Worth Paying For

Our newest QEMM, version 7, pioneers new ways of using the critical area between 640K and 1024K. It optimizes this area, taking into account the many drivers that need more memory at start-up than when running; instantly calculating millions, even tens of millions of possible memory configurations to find still more memory for your applications, TSRs and utilities.

Instant Riches

What does more memory mean in a practical sense? It means that your DOS and MS Windows programs run faster, smoother and more reliably. It means you can continue to add valuable utilities, drivers, TSRs and new capabilities to your PC. Whether it's workhorse drivers like LAN utilities and fax drivers; productivity-enhancers like disk caches and disk compressors; or fun and exciting capabilities like sound boards, CD ROM drivers, graphics tablets, etc. The better your memory is managed, the more versatility and flexibility your PC will have. QEMM 7 lets you have it all without fear of 'out of memory' messages or crashes.

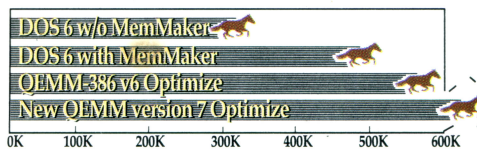
DOS 6 Giveth; DOS 6 Takes Away

The best feature of new DOS 6 is the stable of utilities it includes. Trouble is, they all eat up memory. DoubleSpace file compression needs 43K, Vsafe anti-virus needs 745K, Smartdrv disk cache needs 28K and even Undelete takes 10-14K as a resident program. Using MemMaker, you could easily lose—not gain—available 'conventional' memory in DOS 6.

New QEMM 7 takes the best of the new DOS 6 features into account, finding ways to cut memory demands for these utilities by up to



How to Look a Gift Horse in the Mouth



We tested DOS 6 with and without MemMaker and QEMM6 and our new QEMM 7 runs away from all of them. See details of test conditions at bottom of page.

80%, ensuring that the all-important memory below 640K is free for your programs. And QEMM 7's seemingly small feature of supporting

DOS 6's multiple configurations gives you the flexibility and ease of setup that you expect. (MemMaker doesn't work well with this important DOS 6 feature.)

Page Frame: the Key to Your Future

There's been a lot of jealous talk about our patent-pending Stealth technology. Nobody else can duplicate its 48-115K gains.

The key to Stealth is its use of a 64K reserved area above 640K called the page frame. Besides being used by Stealth, the page frame lets Lotus 1-2-3 r2.x run larger spreadsheets and WordPerfect 5.x larger documents. It's also used by DESQview for multitasking, Novell NetWare, IBM LAN Server and DECnet for reducing the network driver memory footprint, plus games for fast action.

You sacrifice all this when other memory managers turn off the page frame. Stealth saves you room to set up your PC with a mouse, CD ROM, sound board, a network such as Novell NetWare, create 8-24K of extra memory for optimal MS Windows performance, use all of DOS 6's memory-hungry utilities and still have more than 630K to run applications smoothly and safely.



Prior versions of QEMM won nearly every award in sight, as well as remaining the #1 selling memory manager 5 years straight.

Put Your Money on a Winner QEMM 7

The new and ever more exciting capabilities coming to your PC will all compete for memory with your favorite applications, TSRs and drivers. And that makes QEMM 7 the most vital utility you can own.

Our seventh-generation memory manager is a thoroughbred that helps you get the most out of your PC today and tomorrow.

Quarterdeck

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How we got the chart numbers: CPU—486/33 ALR Power/business VEISA machine equipped with 16 megs of RAM and running MS-DOS 6. Comparisons were done using the following memory managers: QEMM 7, QEMM 6.02, MS-DOS 6 MemMaker. In addition to the driver (or drivers) required by each memory manager, the following drivers, DOS resources and programs were loaded for all comparisons: in the CONFIG.SYS file: SETVER.EXE, DOS=HIGH, FILES=20, BUFFERS=10, STACKS=0,0, MVSOUND.SYS, SNDISK2.SYS, SLCD.SYS, DOS SHELL—statement, in the AUTOEXEC.BAT file: VSAFE, MSCDEX, UNDELETE, LSL.COM, NE2000.COM, IPXODI.COM, NETX or EMSNETX, MOUSE.COM, SMARTDRV.COM, PRISCCAP.COM. ©1993 Quarterdeck Office Systems. Trademarks are property of their respective owners.

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